3 Sheets--Sheet 1.

E. H. WILLIAMS.

Improvement in Excavating Machines.

No. 115,998. Patented June 13, 1871.

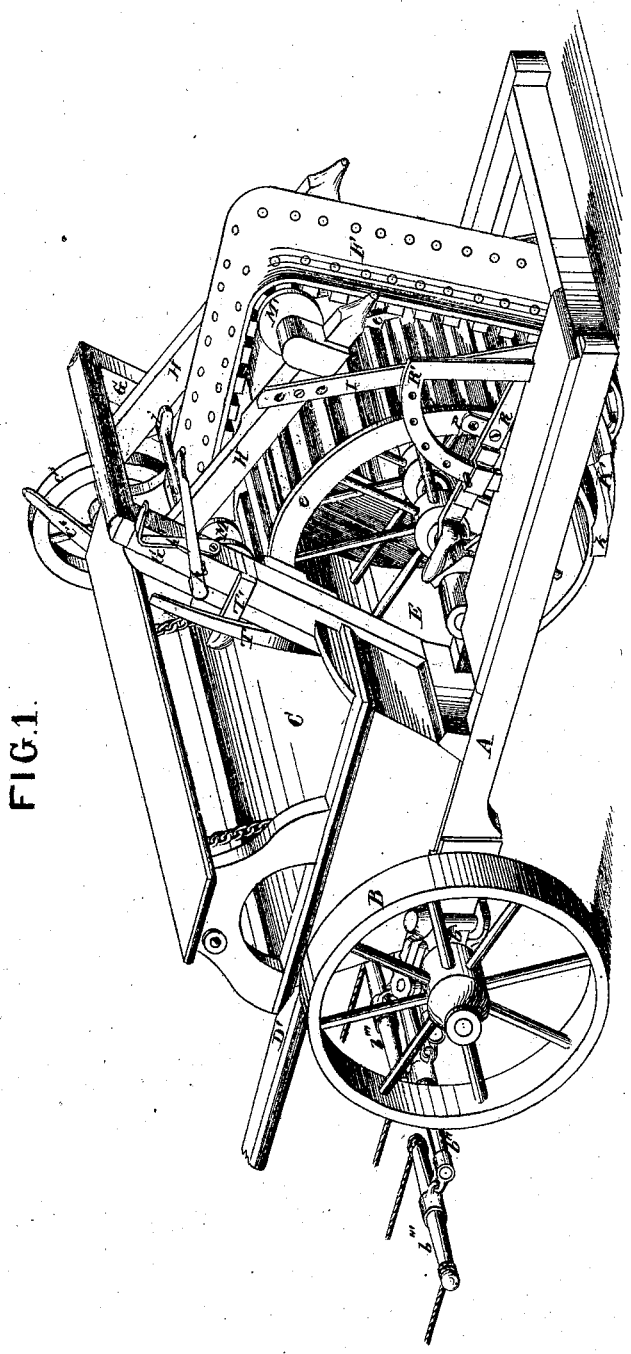

FIG. 1.

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FIG. 2.

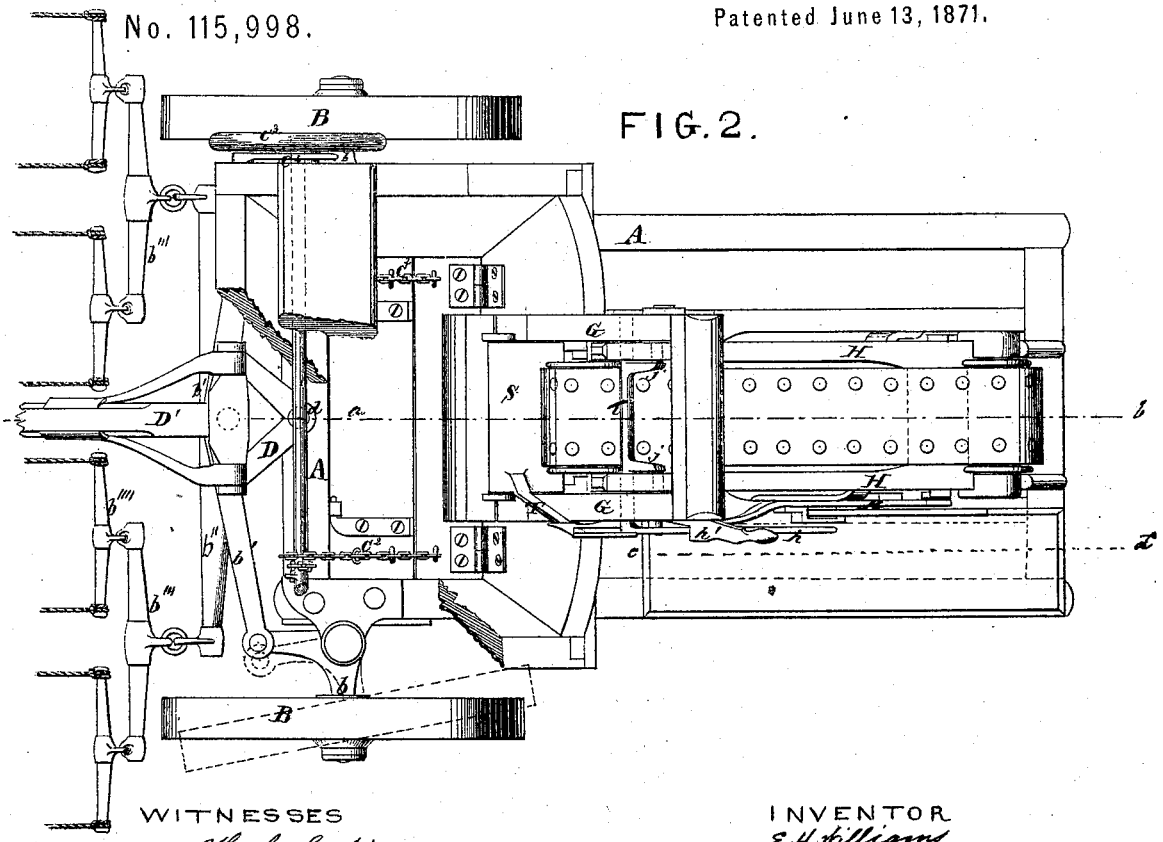

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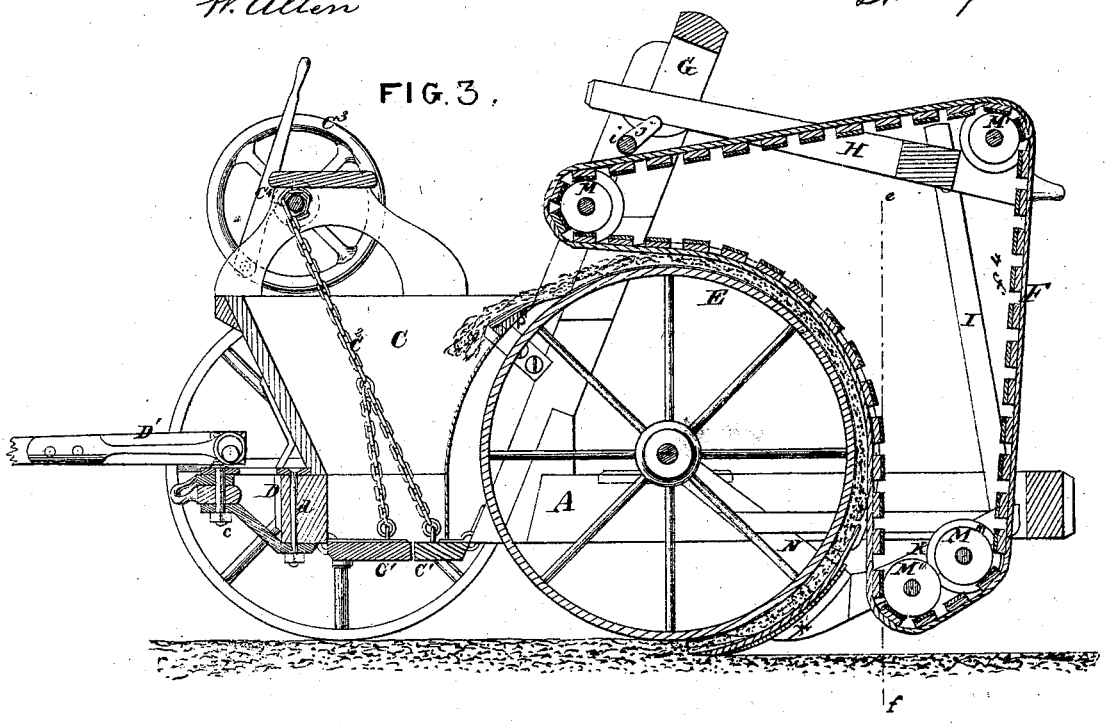
FIG. 3.



E. H. WILLIAMS. 3 Sheets--Sheet 3.

Improvement in Excavating Machines.

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FIG. 4.

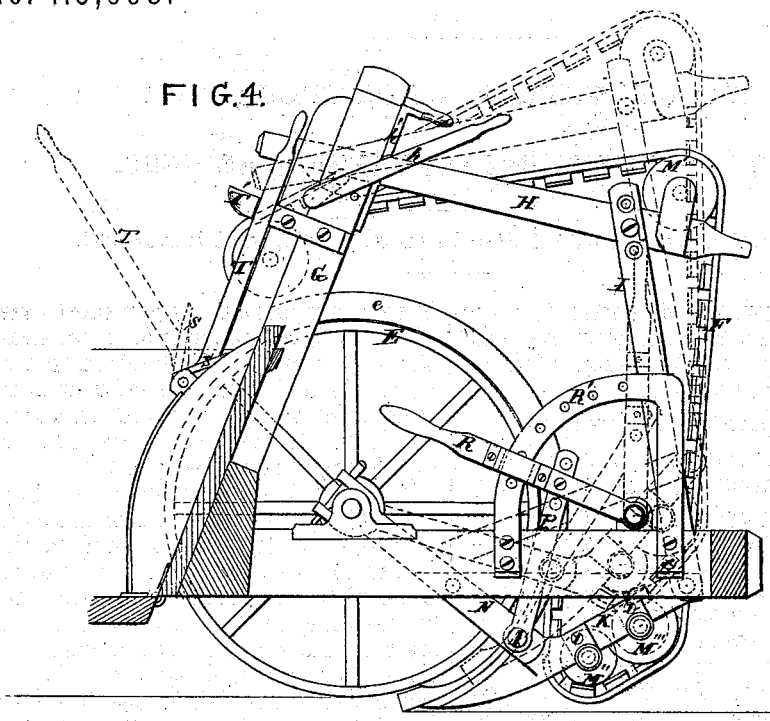


FIG. 5.

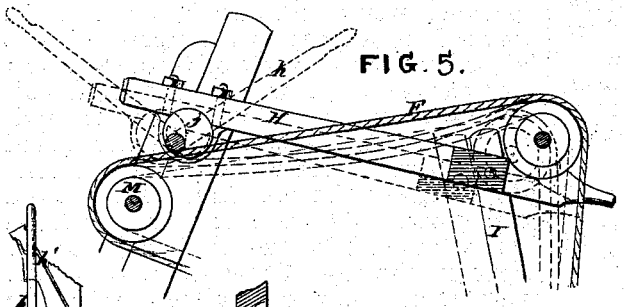


FIG. 8.

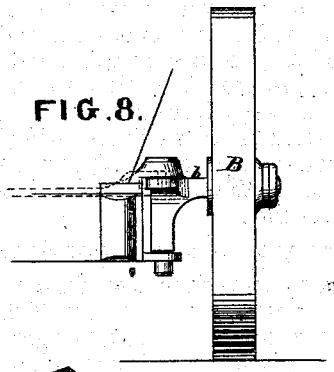


FIG. 6.

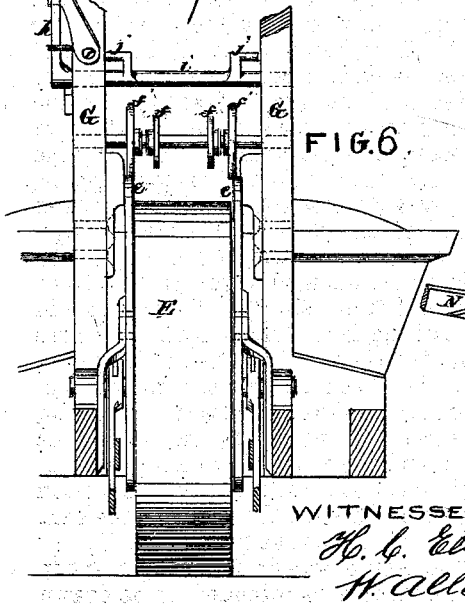


FIG. 7.

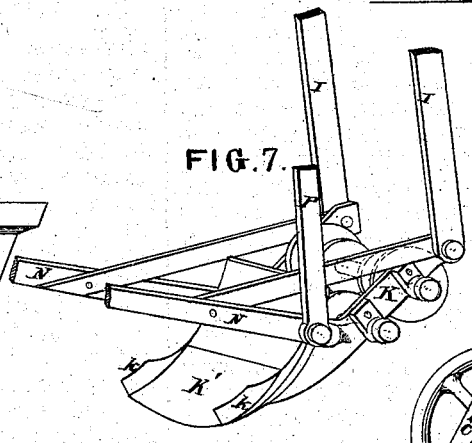
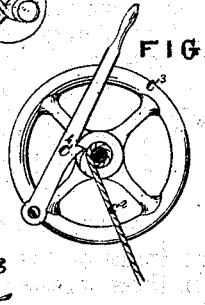


FIG. 9.



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UNITED STATES PATENT OFFICE.

ELIAS H. WILLIAMS, OF CLERMONT, IOWA.

IMPROVEMENT IN EXCAVATING-MACHINES.

Specification forming part of Letters Patent No. 115,998, dated June 13, 1871.

I, ELIAS H. WILLIAMS, of Clermont, in the county of Fayette and State of Iowa, have invented a certain Improved Excavator, of which the following is a specification:

Nature and Objects of the Invention.

My improvements relate to a machine for excavating earth, and are founded upon a machine the subject-matter of Letters Patent of the United States Nos. 35,005 and 69,378.

My present improvements refer to, first, the device for regulating the tension of the endless belt, which acts in concert with the main wheel in raising the earth. The belt, when in action, is drawn against the wheel with sufficient force to enable it to do its duty as a coacter in the lifting and carrying. When the excavating is temporarily stopped, and the machine is used to transport the earth to a place at which it is dumped, the belt is released from the wheel, so that the machine may be more easily transported. Second, to the combination of an earth-elevating wheel, endless apron, receiving and adjustable scraper; and third, to the draft devices hereinafter more fully set forth.

Description of the Accompanying Drawing.

Figure 1 is a perspective view of the machine. Fig. 2 is a top view or plan, a part of the seat-board and box being removed in order to exhibit certain parts more clearly. Fig. 3 is a vertical longitudinal section on the dotted line *a b*, Fig. 2. Fig. 4 is a vertical section, showing in elevation that part of the machine particularly concerned in scraping and elevating. The plane of partial section is the dotted line *c d*, Fig. 2. Fig. 5 is a partial view, showing in one position the adjustable frame from which the scraper and belt-carrying pulleys are suspended. Fig. 6 is a vertical section in the line *e f*, Fig. 3, looking forwardly, and with the belt removed. Fig. 7 is a perspective view of the plow detached from the other portions, so as to exhibit it more plainly. Fig. 8 is a detached view of one wheel, showing the short axle and bell-crank. Fig. 9 is a view of the wheel actuating the chain-shaft which operates the dumping-door at the bottom of the box.

General Description.

A is the frame of the machine, which is mounted on three wheels. Two wheels, B B, in front are journaled upon short axles *b*, each of which forms one arm of a bell-crank lever, the other arm being connected to a front bar, *b′*, to which the draft-power is attached. The front axles being short and connected to the outside of the frame A, there is no axle crossing the machine at that point, and consequently the box C is not incommoded, but is open and clear for the reception of the earth, which is raised by the excavator and carried in the box to the place where it is to be dumped. In front of the carriage-frame A is a triangular draft-frame, D, pivoted by a pin, *d*, to the main carriage A, and also pivoted to the front bar *b′* and the whiffletree *b″*. To the ends of the latter are attached the double-trees *b‴*, which have single-trees *b⁗* *b⁗*, &c., to which the traces of the draft-horses are connected. The front bar *b′* is jointed to the ends of the bell-crank arms of the axles *b*, so that as the tongue D′ is swerved to the right or to the left the bell-cranks rotate on their pivots, and the front wheels B B are moved simultaneously so as to correspond with the line of direction of the tongue, and to assume the required line of motion. The tongue D′ has its bearings in lugs on the shaft-frame D, and has a free vertical motion thereon. The whiffletree *b″* is attached below the draft-frame D, and supported thereby. Of the four movable portions in this part of the machine—to wit, the tongue D′, draft-frame D, front bar *b′*, and whiffletree *b″*—each has a certain amount of independence of motion: First, the tongue moves freely up and down without any extra weight being thrown upon it; second, the draft-frame D has motion in a horizontal plane, produced by lateral motion of the tongue, and having for its axis the pin *d* in the carriage-frame A; third, the lateral motion of the tongue is communicated through the draft-frame D to the front bar *b′*, while the pin *c* in the middle of the front bar *b′* describes the arc of a circle, the center of which is the pin *d*, and the ends of the bar *b′* communicate motion to the bell-cranks of the axles *b b*; fourth, the whiffletree is connected by the pin *c* to the front bar *b′* and the frame D, and moves with them; but it has also an independent motion on pin *c* as a pivot when the spans on the near and off sides of the tongue pull unequally.

As will be seen by the draft arrangement in Fig. 2, the machine is intended to be drawn

by four horses abreast. By the employment of the short bell-crank axles described in lieu of an ordinary axle, I am enabled to continue the earth-receiving box of my excavator further forward and to place it lower, thus decreasing the height to which the earth must be raised, while the connection of the draft devices with the inner ends of the bell-crank axles is necessary; and my particular construction of draft devices, each having a motion independent of the other, as described, enables me to guide the machine more readily.

The wheel E occupies a position in the carriage-frame A to the rear of the earth-box C, and supports the machine at that point. The wheel E has, besides, a function in connection with the belt F in assisting in carrying up the excavated earth and conveying it into the box C. G G are backwardly-inclined posts rising from the carriage-frame A. H is an adjustable frame supported by the posts G G and by the standards I I, which rise from the vertically-adjustable frame K, to which the plow is attached, and which also carries the lower rollers M″ M‴, over which the belt F traverses. The adjustable frame H is the upper means of support of the traversing-belt F, the latter running over the upper roller M′. This adjustable frame H has a capacity for two motions—forward and backward by means of the lever *h*, also up and down by means of the lever R, which is pivoted to the frame A—and is connected with the plow-frame K. The former motion is for the purpose of slackening or tightening the belt. The latter motion is coincident with that of the plow-frame K, to which the said frame H is attached by the standards I. K is a vertically-adjustable frame connected to the axle of the wheel E by drag-bars N, one on each side, and suspended by a bar, P, from a pivoted lever, R, by whose vertical motion the said plow-holder K is adjusted as to height. The sector-rack R′ is the means of holding the lever R at any required adjustment, so that the plow may be held above the ground in inoperative condition, or may be lowered to its work, as shown in Figs. 3 and 4. On the plow-frame K are journaled two rollers, M″ M‴, over which the belt runs at its lowest point. On the standard G is journaled another roller, M. The belt F is driven by the contact of the soil which fills the interval between it and the revolving wheel E, and the rollers M M′ M″ M‴ form the guides and carriers. The roller M has permanent bearings; but the rollers M′ M″ M‴ are in parts of the machine having vertical adjustment, as the scraper is in working position or otherwise. The forward vibration of the lever *h* rotates the shaft *i* and causes the bent arms or cranks *j j* to throw forward the frame H, which rocks forward on the standards I and loosens the belt F. *h′* is a latch for holding the lever *h* when the frame H is in working position. Instead of crank-arms an eccentric arrangement may be used, as shown in Fig. 5. In order to avoid the inconvenience of earth adhering to the pulleys or rollers which carry the belt F it is found necessary to make the said rollers short, so that they will support the belt by its edges, and to provide the belt with rigid transverse slats f^3, which are faced with metal and move upon the thin disks or wheels *f f* of the rollers to decrease the friction of the endless belt and lessen its wear, while the flanges f^1 f^1 of the rollers prevent the belt from moving laterally. In my perfected machine I have found great benefit from facing these slats with steel or iron, which prevents any appreciable wear between the slats and rollers, but without which the ends of the slats were quickly worn off obliquely, and the rollers in turn worn to a corresponding bevel, resulting in the destruction of both. S is a scraper, which has its bearings on the back of the earth-box C, its edge resting upon the periphery of the wheel E, so as to scrape the dirt therefrom and deliver it into the box. The lever T operates the scraper, which may be locked in working position by the latch T′. The bottom of the box C has hinged shutters C^1, which may be dropped to discharge the load collected in the box. The shutters are closed by chains C^2 winding on a shaft which is rotated by the wheel C^3 and locked by the latch C^4.

Operation.

The operation of the machine has been to some extent described incidentally in the previous description, but may be briefly set forth as follows: The machine proceeds to its work with the scraper S removed from contact with the wheel E, the lever T being thrown forward. The wheel is thus relieved of the friction of the scraper. The frame H is thrown upward so as to raise the plow K′ from the ground. The frame H is also thrown forward by the forward rotation of the lever *h*. This has the effect of loosening the belt F, so that the machine draws more easily. The positions of these various adjustable parts, to adapt the machine for transportation from place to place, are indicated by dotted lines in Fig. 4. It is needless to specify the mode of hitching the team to the machine or to further elucidate the operation of the remaining gear of the fore carriage, the tongue D′, draft-frame D, front bar *b′*, whiffletree *b″*, bell-crank axle *b*, and other parts involved in the mere transportation of the machine. We may suppose that the machine has reached the scene of its labors and is about to be set to work. The bottom of the box C is secured by means of the chains C^2 and the latch-lever C^4, which acts as a detent to notches on the shaft of the wheel C^3. The lever *h* is moved rearward to throw back the frame H to its working position, as shown in Figs. 3 and 4. The lever T is moved backward to set the scraper S against the wheel. The lever R is vibrated forward to lower the plow K′ to its work, as shown in the last-mentioned figures. The shape of the plow is incidentally shown in several of the figures, but is more clearly exhibited in

the perspective view of a detached portion, Fig. 7. It has a scoop-shape, the edge having a downward convexity, so that it digs more deeply into the soil at the middle portion of the blade than at the ends of the blade, or what may be termed the corners, at which the wings *k k* are situated. The surface of the shovel or plow K′ is prolonged upward and backward, following the general curve of the wheel E, and the soil is lifted by the scraper and is pushed upward by succeeding bodies of soil as the machine progresses. At the upward rear edge of the plow or shovel the belt F comes into play and confines the earth against the periphery of the wheel E, the latter being driven by contact with the ground as the machine progresses. After passing the summit of the wheel E the soil passes along with the wheel, the side flanges *e e* keeping it from falling off laterally. It is then met by the scraper S, which removes all adhering portions from the wheel and guides the earth into the box C, which is so placed and constructed with reference to the discharge of soil into it at S that it becomes automatically piled up without the necessity of manual labor in stowing it in the box. The flanges *e e*, against which the wheel runs, keep the belt in position for that portion of its track. At other points it is kept by the side flanges *f′ f′* of the rollers M M′ M″ M‴. These flanges are shown in Fig. 6. The smaller wheels *f f* act as a drum for the passage of the belt F. The box C having become filled with earth, the lever T is thrown forward to relieve the wheel of the friction of the scraper. The lever *h* is thrown forward to release the belt from pressure on the wheel. The lever R is thrown backward and locked on the sector R′ to raise the plow clear of the soil. The machine is then driven to the place where the earth is to be dumped. This being reached, the detent-lever C^4 is thrown forward to release the chain-shaft, and the doors at the bottom of the box C are opened by the weight of the earth which then escapes. The machine being again drawn to the place where earth is to be excavated, the parts are restored to working order and the process is repeated.

Claims.

What I claim as new is—

1. The frame H carrying the roller M′, and adjustable in two directions vertically with the plow-frame, and horizontally, by means of the lever *h*, to tighten or loosen the belt, all substantially as explained.

2. The combination of the earth-elevating wheel E, endless apron F, the receiving-box C embracing the front and a part of the side of said wheel, and the adjustable scraper S for removing the earth from the wheel and delivering it into the box, substantially as herein explained.

3. In combination with an excavating-machine, constructed as described, the bell-crank axle's front bar *b′*, pivoted draft-frame D, tongue D′, and whiffletree *b″*, all arranged and operated as described.

ELIAS H. WILLIAMS.

Witnesses:

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OCTAVIUS KNIGHT.