Sheet 1, 4 Sheets.

# O. S. Chapman.

## Excavating Mach.

No. 63,857. Patented Apr. 16, 1867

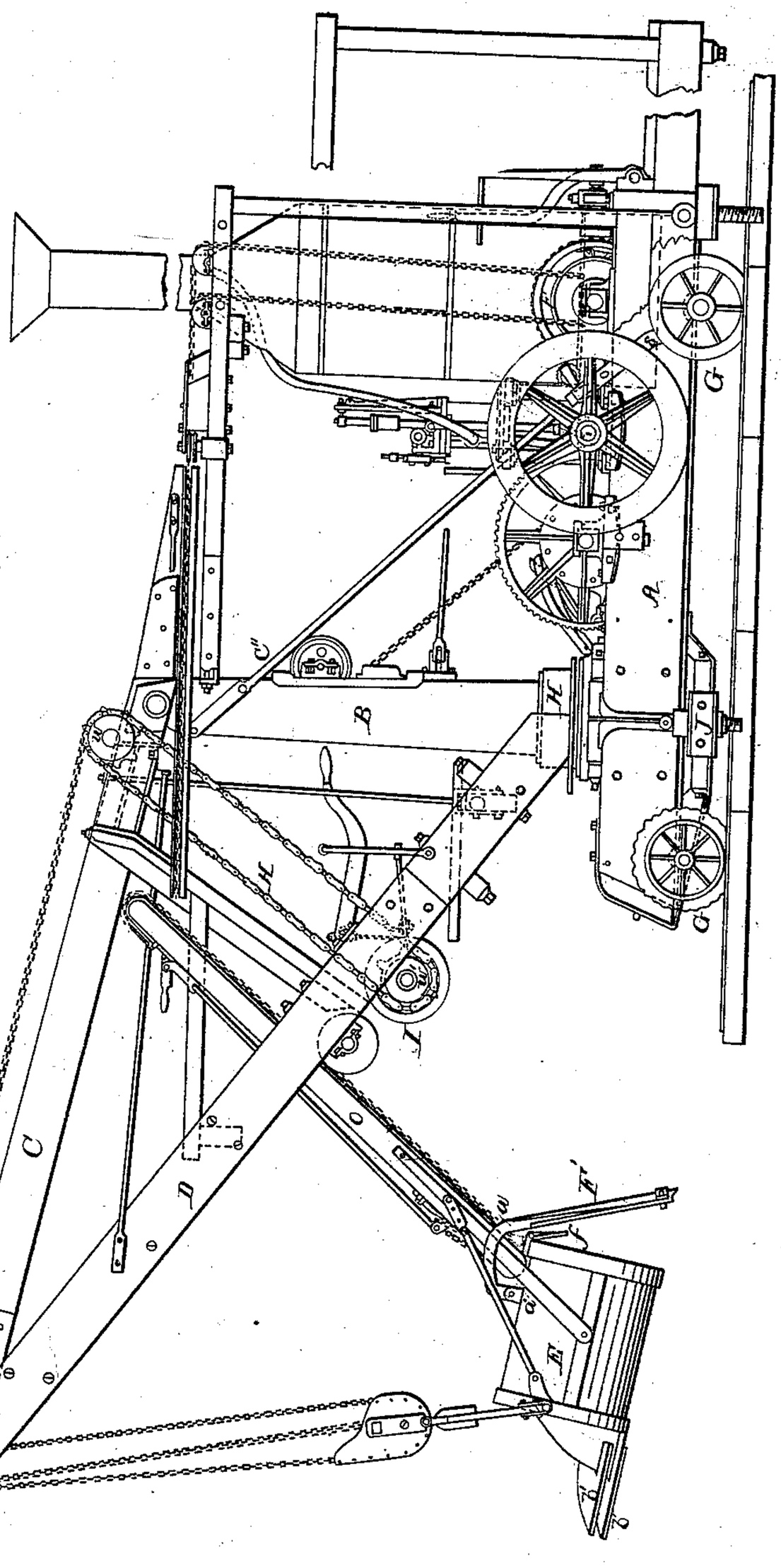



Fig. 1.

Witnesses:
Geo. I. Bergen
P. T. Dodge

Inventor:
O. S. Chapman
By Dodge & Munn
Attorneys

Sheet 2, 4 Sheets.

# O. S. Chapman.

## Excavating Mach.

No. 63,857. Patented Apr. 16, 1867.

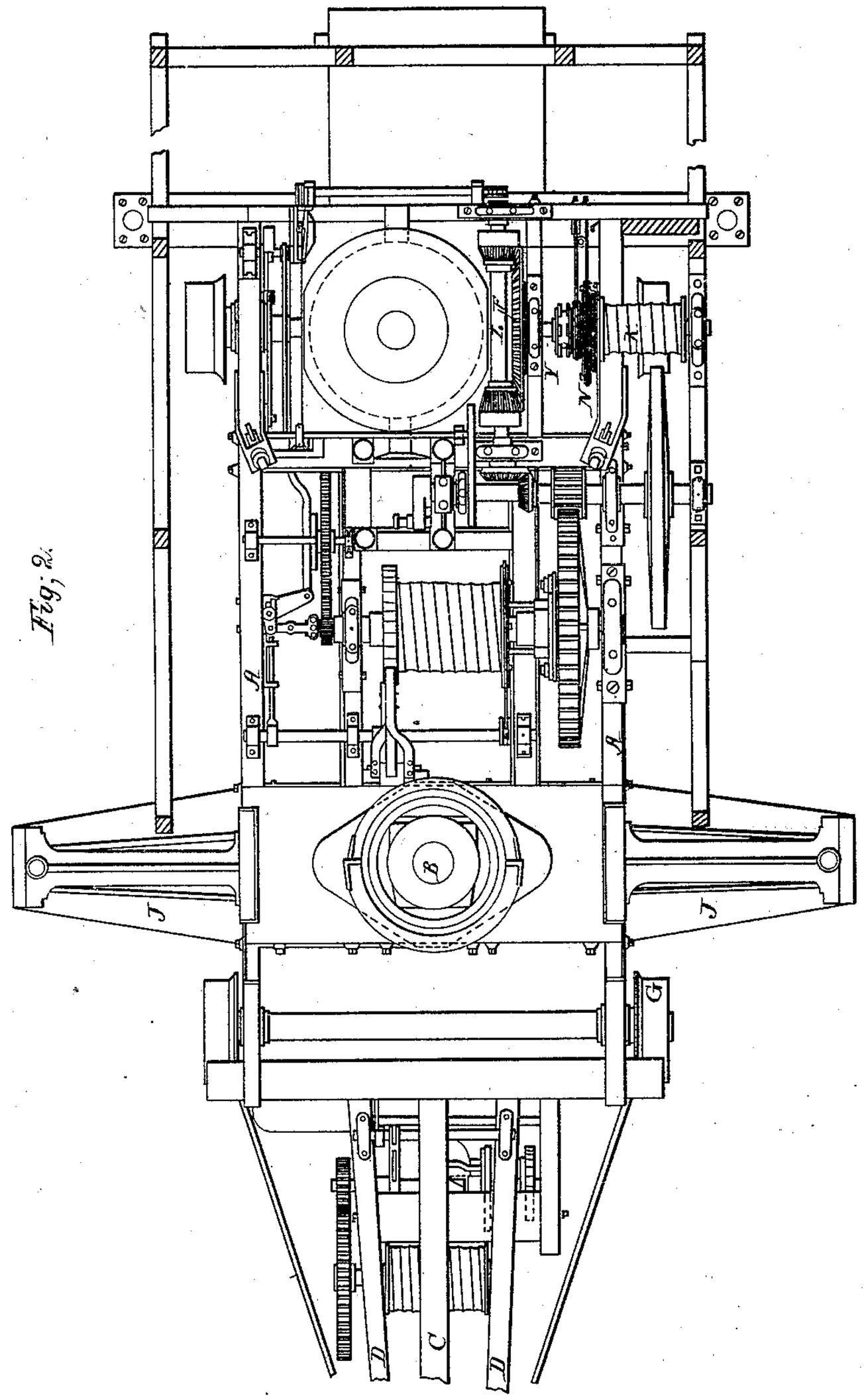



Fig. 2.

Witnesses;
Geo. S. Bergen
P. J. Dodge

Inventor;
O. S. Chapman
By Dodge & Munn
attorneys

Sheet 3, 4 Sheets.

# O. S. Chapman.

## Excavating Mach.

No. 63,857. Patented Apr. 16, 1867.

Fig. 3.

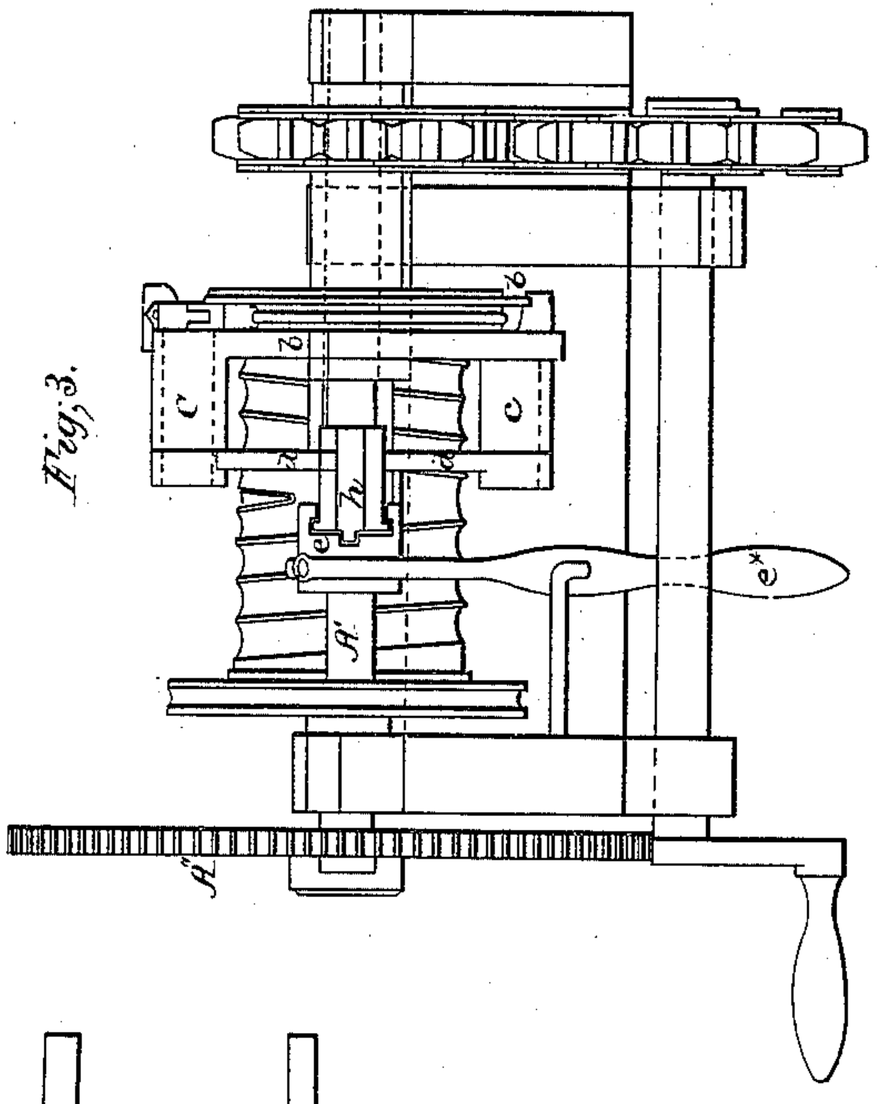



Fig. 4.

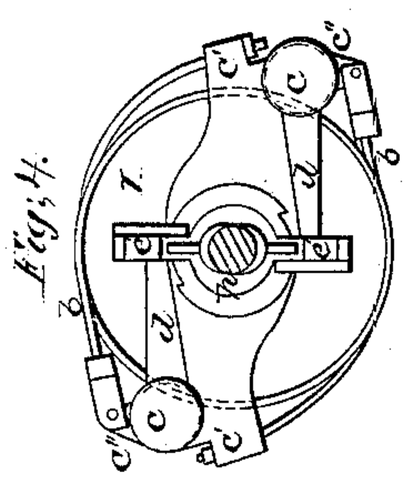



Fig. 5.

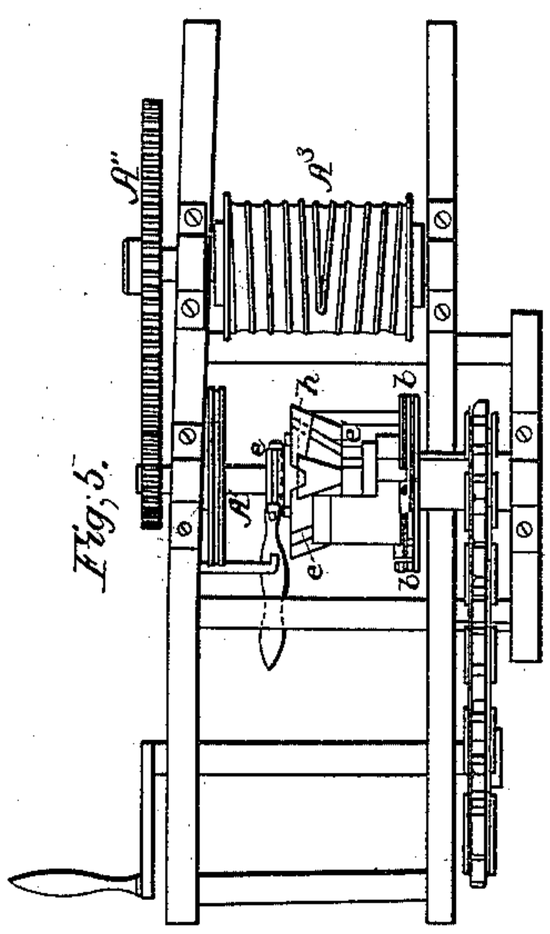



Fig. 6.

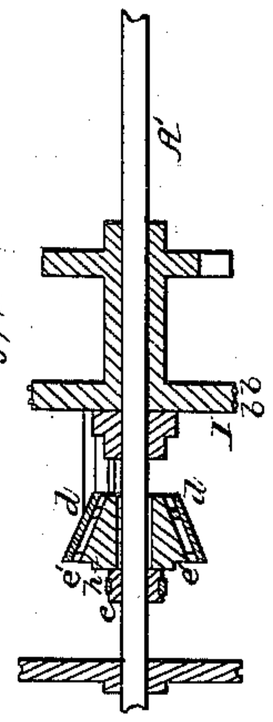
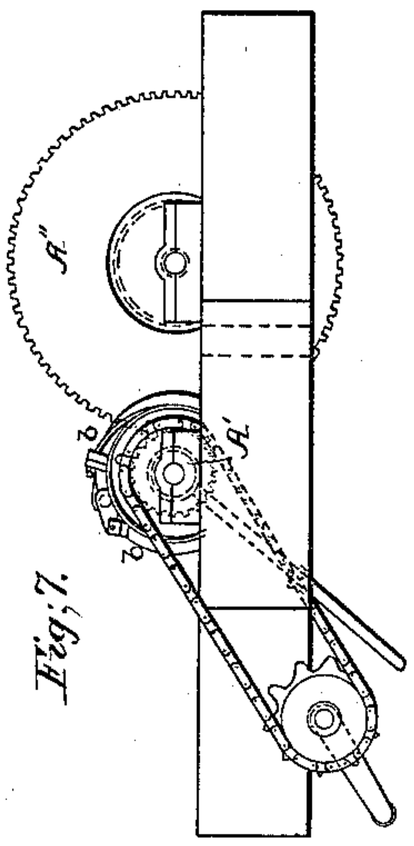



Fig. 7.




Witnesses;
Geo. I. Bergen
P. J. Dodge

Inventor;
O. S. Chapman
By Dodge & Munn
Attorneys

Sheet 4, 4 Sheets.

# O. S. Chapman.

## Excavating Mach.

No. 63,857. Patented Apr. 16, 1867.

Witnesses:
Geo. I. Bergen
P. J. Dodge

Inventor:
O. S. Chapman
By Dodge & Munn
Attorneys

# United States Patent Office.

OLIVER S. CHAPMAN, OF CANTON, MASSACHUSETTS.

*Letters Patent No.* 63,857, *dated April* 16, 1867.

## IMPROVED EXCAVATOR.

The Schedule referred to in these Letters Patent and making part of the same.

TO WHOM IT MAY CONCERN:

Be it known that I, O. S. CHAPMAN, of Canton, in the county of Norfolk, and State of Massachusetts, have invented certain new and useful improvements in Excavators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts wherever they occur.

To enable others skilled in the art to construct and use my improvements, I will proceed to describe them.

My invention consists in certain improvements in steam excavators, which said improvements are hereinafter explained in detail.

Figure 1 is a side elevation of the machine.

Figure 2 is a top plan view with a portion removed.

Figures 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15, are views of portions shown in detail.

In its general plan and construction the machine is similar to those now in use, the construction of which is well known, and therefore need not be herein described. As heretofore constructed, these machines have been liable to frequent breakage and disarrangement, involving delays and heavy expenses. My invention has for its object so perfecting the machine in its details as to obviate these difficulties, and, at the same time, rendering it much more perfect in its operation.

In figs. 1 and 2, A represents the main frame, on which are mounted the machine and steam engine for operating it. B represents the main post on which the crane that carries the shovel is mounted. This post B I construct of cast iron, in the form of a tubular pillar or column, as shown in vertical section in fig. 8. In order to give to it the requisite strength without rendering it too heavy, I construct it with internal ribs or flanges, *o'*. At the top it is cast with a shoulder to receive the collar which supports the crane, and permits it to turn on the post B. The journal thus formed at the upper end of the post is turned off smooth, and has a steel ring, *o''*, shrunk on to it, for the twofold purpose of giving it strength and preventing it from breaking, and also to prevent the rapid wear at that point. The post thus made is secured in position by means of the socket B', which rests on the cross-bar J of the main frame, and supported by the truss-rods *p*, as shown in fig. 8. A strong circular collar, B'', is bolted firmly to the cross-bars above J, and has a hole of proper size to receive the post B, the post being slightly tapering from the top of the collar B'' to its lower end, so that it will fit snugly in place, and can be readily removed when desired. At the point where the braces C'' are connected to the post B, near its upper end, recesses are made in the post, as shown in section in fig. 10, which is a cross-section of the post taken on the line *x x* of fig. 8. The braces C'' are provided with lugs forged solid thereon, of proper size to fill these recesses, so that when the braces are bolted to the post the lugs receive the strain, and thus unite the post and braces firmly, and at the same time relieve the bolts from the excessive strain which would otherwise be thrown upon them, and by which they were frequently broken as formerly used. It has been customary to construct the crane C with cast-iron plates at its outer end to receive and hold the end of the brace D; but these plates are liable to break when subjected to the heavy work which the machine is required to perform. I construct the side-plates C' of wrought iron, as shown in fig. 9, with a flange *a** at the top, and with strong cheek-pieces, E, bolted securely at the outer end, thus forming a socket to receive and hold the upper end of the brace D that will stand all the strain and work required of the machine. The lower end of the brace C' I attach to the side-bars of the main frame by a stirrup, S, which passes entirely around the side-bar, as shown in fig. 14. As these braces have to resist a heavy downward thrust when the crane is swung around to either side, and also a heavy upward strain when the crane is swung in the opposite direction, and as this alternate thrusting and pulling soon loosens or breaks the bolts by which the stirrup is secured to the frame, I place on the upper edge of the bar A a heavy metallic plate, P, having a lug, *y*, projecting from its upper face, as shown in fig. 14, and then secure the stirrup by means of a strong key, *l*, which receives the force of the downward thrust, and by which the stirrup can be tightened up whenever necessary.

In fig. 2, K represents the drum on which is wound the chain that swings the crane to one or the other side, as may be necessary to bring the shovel to the required position, and this drum is operated by a gear-wheel, F. As this must be put in operation at every movement of the crane, and has to be thrown in and out

of gear with the bevel-gear on shaft L at each movement, it is obvious that the strain caused by the sudden throwing of it into gear so often will be very severe on the cogs, and have a tendency to frequently break the cogs. To remedy this I construct this wheel F as represented in figs. 11 and 12, the first being a front face view, and the latter a transverse section taken on the line *y y* of fig. 11. The main portion of the wheel consists of a disk having the cogs cut on its face or periphery, according as it is intended to be a spur or bevel-gear, and having four or more oblong openings made through it, as shown in fig. 11, with a recess in its rear face to receive the disk F′, which is secured rigidly to the shaft *m*, the wheel F being loose on the shaft. This disk F′ has on its face lugs *e′*, which fit into the openings in the wheel F in such a manner as to leave a space on the two sides of the lug *e′*, which space is filled with rubber or other elastic material, as represented by *i* in fig. 11. A plate or cap, *t*, is then placed over the face of the opening and secured by a screw, as shown in fig. 12, which confines the rubber in place and firmly unites the two parts F and F′. It will be readily seen that when the wheel F is thrown suddenly in gear with another wheel which is in motion, the shock will expend itself, in a great measure, upon the rubber springs *i*, and thereby prevent the cogs from being broken.

As in moving the machine the track or foundation is at times liable to be uneven, it is necessary to have on the shaft of the drum K a friction-wheel arranged to be self-tightening, so that if the machinery shall bind or not work freely, and more power be required to turn the drum K, it may be had by the operation of the clutch itself. This clutch is represented by N, in fig. 2, and its construction is shown in detail in fig. 15. In this case the two metal bands are used, working on the periphery of the disk or wheel N, the same as in the case of the clutch formerly described, the bands *v* being secured at one end by a nut, so as to be adjusted, and the opposite ends being secured to the short arm of a rock-shaft, *c*, the same as in the former case. The long arms, *d′*, of these rock-shafts rest against the face of square block W, mounted on the same shaft, Y, on which the wheel or disk N is mounted, as shown in fig. 15. It will be seen that if the wheel N commences to slip on the shaft the projecting corners of the block W coming in contact with the arms *d′*, will press them outward, and thus cause the bands *v* to be drawn tighter and grip the wheel N with increasing force. In order that the power thus applied may be uniform whichever way the shaft Y revolves, the projections *o**, which strike the arms *d′* near their outer end, project further than the opposite corners which strike the arms further in, the relative projection of these points being proportioned so that whichever of them operates the arm *d′*, it will be moved the same distance, and consequently exert the same force on the bands *v*. By these means the clutch is made self-operating, and just in proportion as more power is required to operate the drum, from whatever cause, in that same proportion will the bands be tightened on the wheel N by the operation of the block W and the arms *d′* of the rock-shaft *c*.

It should be understood that the bands *v* will be drawn sufficiently tight by means of the nuts to hold the wheel N in all ordinary cases, and that hence the self-tightening devices will only come into play when extra power is required, on account of the cramping or binding of the parts, as above described, or when the bands *v* may have become loosened.

The block W has attached to it a collar, *w′*, around which a band, *w′*, passes, as represented in fig. 15, one end of said band being secured to the frame of the machine at *t**, and the opposite end, *y′*, being secured to a lever operated by the foot of the attendant, so that, whenever desired, the attendant, by simply pressing on the lever, can tighten the rod and apply any required force. The shovel E is made of metal, and is provided with heavy steel prongs, *b′*, which project at the front, as shown in fig. 1. These prongs are intended to protect the shovel from injury when brought in contact with stones or other heavy objects, and also to hook under roots or rocks that cannot be readily seized hold of by the shovel itself. It has a door, F″, hinged so as to open and permit the contents of the shovel to be emptied at its rear end when its front end is elevated. In order to permit this door F″ to be raised far enough to be out of the way, and yet not strike against the bar O, it is suspended by the bent arms *a*, and hinged at *a′* on the upper side of the shovel, some distance in front of the rear end, as shown in fig. 1. The door is so cut away at its upper side, in order not to hit the bar O when opened, that it is too narrow to cover the entire rear end of the shovel, and to make up for this deficiency I hinge a second and narrower door, *f*, to the upper rear end of the shovel, in such a manner that when the main or outer door is closed it will also close the inner door *f* and hold it closed. Whenever the door F″ is opened the door *f* is released and permitted to swing free on its hinges, and by these means I am enabled to raise the shovel at its front end sufficiently to empty it of its contents almost instantly, and at the same time have the door F″ swing entirely out of the way.

For the purpose of having more complete control of the shovel, I have constructed a novel style of clutch for throwing the motive parts which operate the shovel in and out of operation, these parts being shown in figs. 3, 4, 5, 6, and 7.

As usual, the shovel is operated by means of chains wound on a drum, A³, driven by gear-wheel A″, which engages with a smaller wheel on shaft A′, on which latter is located the clutch. This clutch consists of a disk I, fig. 4, having grooves in its periphery to receive metal bands *b*, one end of which is secured to a projection *c′* by means of a nut, by which the band *b* may be tightened or loosened at pleasure; the bands, of which there are two, extend around the disk I, and are attached at their opposite ends to the short arm *c″*, of a rock-shaft *c*, as shown in figs. 4 and 7, there being longer arms, *d*, attached to the rock-shaft *c*, which arms project inward as far as the centre of the disk I. The inner ends of these arms *d* work in the inclined slots *e′*, formed on opposite sides of a hub, *h*, shown in section in fig. 6, and in plan in fig. 3. This hub *h* is connected to a collar *e*, which slides loosely on shaft A′, the hub *h* being connected to the collar *e*, as shown in fig. 3, in such a manner that while it is compelled to move with the collar longitudinally on the shaft A, it can move laterally independent of the collar *e*, the centre of the hub *h* having an oblong hole cut in it for that purpose, as shown in fig. 4. The object of this lateral movement of the hub *h* on the shaft is to permit it to adjust itself to suit

the position of the arms *d*, as they will vary according as one or the other of the belts *b* may be more or less tightened or loosened, and thus to bring the strain equally on both belts *b*. A lever, *e**, is connected with the collar *e*, by which it is moved to and fro on the shaft A, and as it is moved toward the disk I the inclines *e'* in the hub *h* force the arms *d* outward, thereby drawing the bands *b* tight around the disk I. By this construction and arrangement of the parts the operator is able to control the operation or movements of the shovel in the most perfect manner, so that in case the shovel comes in contact with a rock or any similar obstruction, it can be instantly released, and thus protected from injury, and at the same time, by the use of the long arms *d*, and the inclines for operating them, great power is obtained to tighten the bands *b*, and thereby give motion to the drum $A^3$. On the shaft of the wheel at the rear end of the crane, over which the chain Y' passes, is mounted a sprocket-wheel *w*, as shown in fig. 1, and on the shaft of the wheel I, on which is mounted the clutch last described, is placed a similar sprocket-wheel, *w'*, and around these two sprocket-wheels passes an endless chain, H*. By this means, when the chain Y' is set in motion, it communicates motion to the wheel I, and thereby to the drum on which is wound the chain that operates the shovel, and as by means of the clutch the shovel may be made to operate with the wheel *w*, or be thrown out of operation at pleasure, it is obvious that it can be controlled in its movements at the will of the operator.

The machine thus constructed is mounted on car-wheels, G, as shown in plan in fig. 13, there being a pulley or wheel, T', secured to one of the axles, by which motion is imparted to the machine from the engine. These wheels G are placed outside of the main frame, and arranged to run on a track which is constructed in sections, so that as fast as the machine is moved forward a section of the track in rear of the machine is taken up and laid in front of the machine. Two or more of these wheels G are provided with a radially-projecting flange, which is serrated or notched, as shown in fig. 1, to afford means of readily turning the wheel by means of levers, when it is desired to move it but a little distance, or the engine fails to move it. Another set of car-wheels, T, is also provided, of larger diameter than the wheels G, and placed at proper distances apart to run on an ordinary railroad track. These wheels T being of larger diameter than the wheels G, will so elevate the machine when placed on a railroad track as to clear the wheels G from the rails and carry them over cross-tracks, &c., without touching or hitting any obstruction in the form of rails, ties, frogs, &c.

By these improvements the machine, as a whole, is so perfected that it will work with great rapidity and ease, and with far less liability to break or become deranged than any similar machine heretofore constructed. It is designed for use on railroads in excavating earth or gravel and filling it into cars, and also may be used as a dredge, the machine being placed on a scow or on a temporary track built on piles, according to the locality and kind of work to be performed.

Having thus described my invention, what I claim, is—

1. The shovel E, provided with the doors F'' and *f*, arranged to operate as herein described.

2. The combination of the laterally-adjustable hub *h*, provided with the inclines *e'* and the rock-shafts *c*, for tightening the friction bands *b*, substantially as and for the purpose set forth.

3. The combination of the bands *v*, rock-shafts *c*, provided with the arms or levers *d'*, and the block W, when arranged to operate as and for the purpose set forth.

4. Constructing the wheels with a notched flange, as represented in fig. 1, for the purpose herein set forth.

5. I claim constructing the machine with the extra wheels T, of larger diameter than the wheels G, for the purpose of running the same on ordinary railway tracks clear of obstructions, substantially as set forth.

6. The compound gear-wheel, consisting of the movable portion F, having slots therein, and the disk F', with projections to fit into said slots with the rubber or other yielding material interposed, the whole being arranged for joint operation substantially as shown and described.

7. The combination of the clutch-wheel I, constructed and arranged as described, with the endless chain H* and sprocket *w* and *w'*, as set forth.

OLIVER S. CHAPMAN.

Witnesses:

CHAS. S. LINCOLN,

JOHN SOUTHER.