

(No Model.)

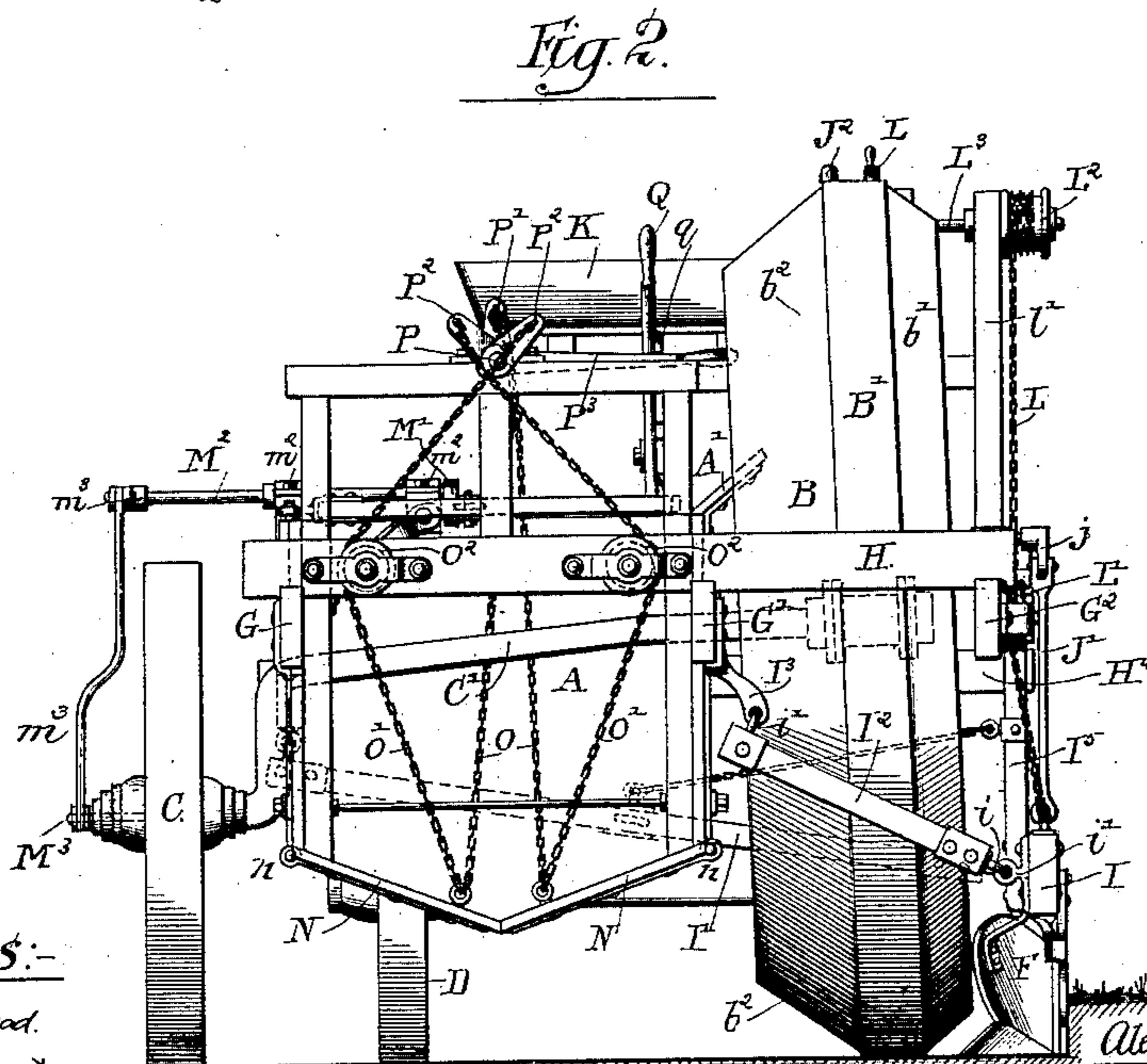
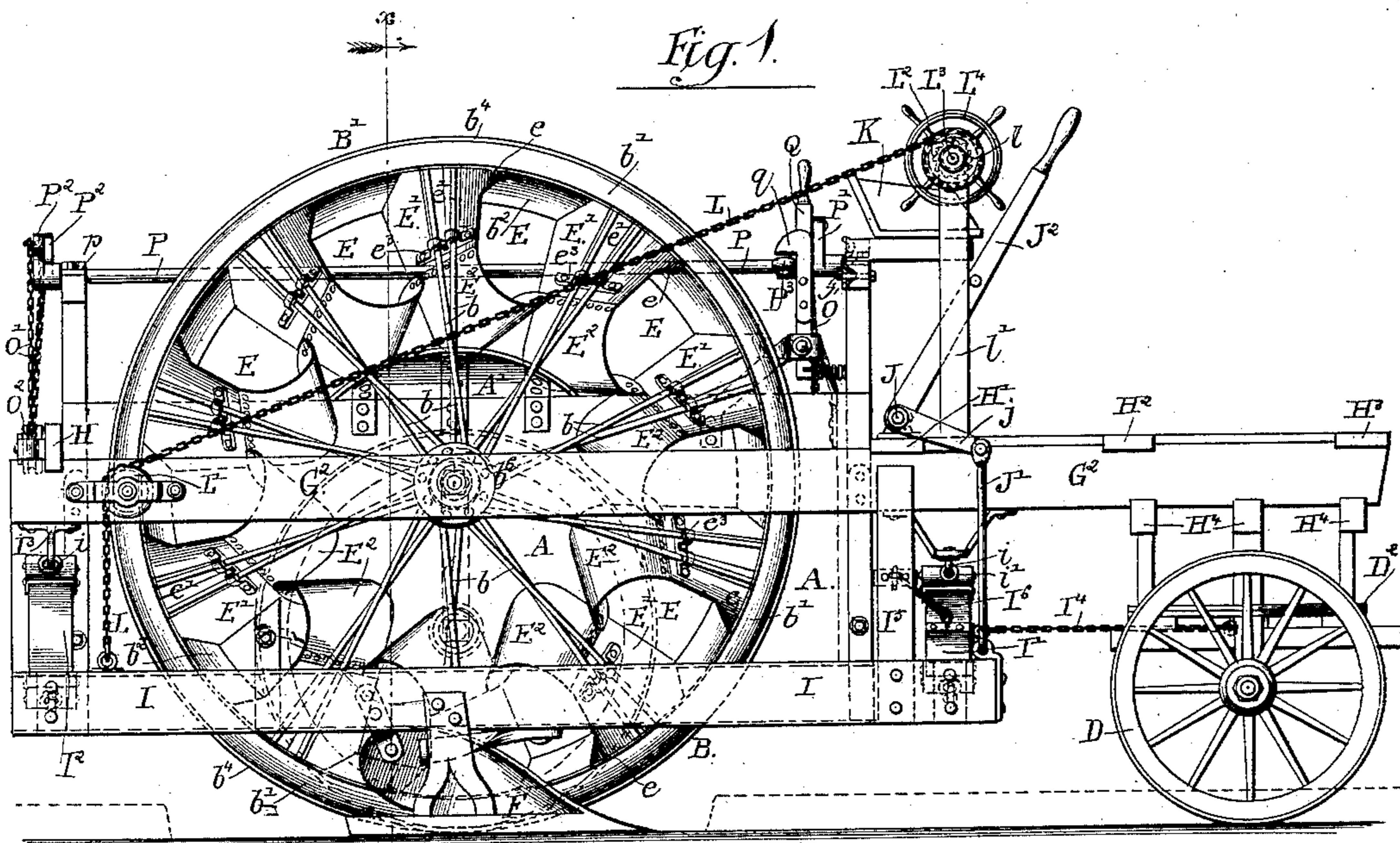
3 Sheets—Sheet 1.

A. M. WOOLFOLK.

EXCAVATING DEVICE.

No. 360,548.

Patented Apr. 5, 1887.



Witnesses:

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Geo. Boyer Sumner.

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(No Model.)

3 Sheets—Sheet 2.

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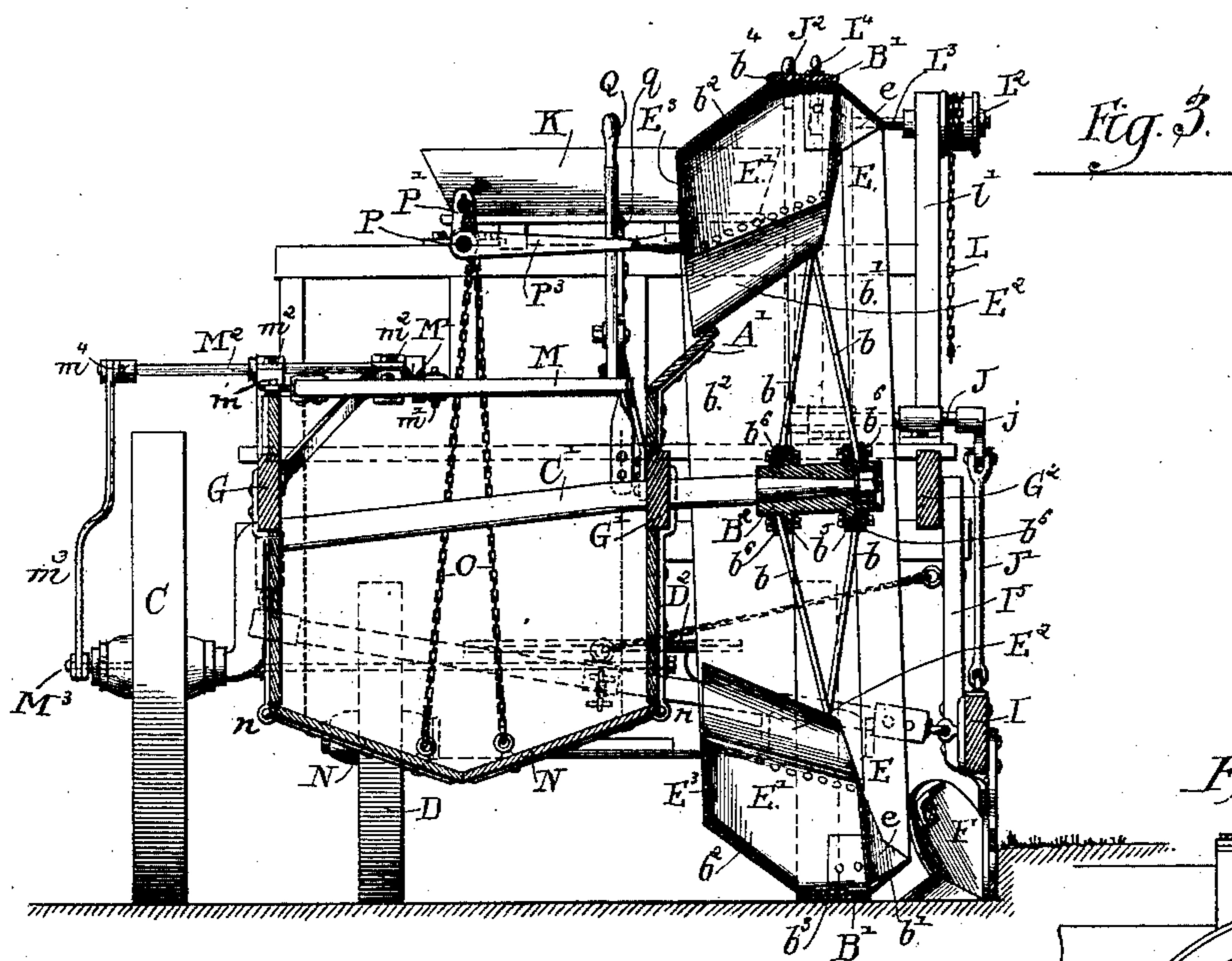


Fig. 3.

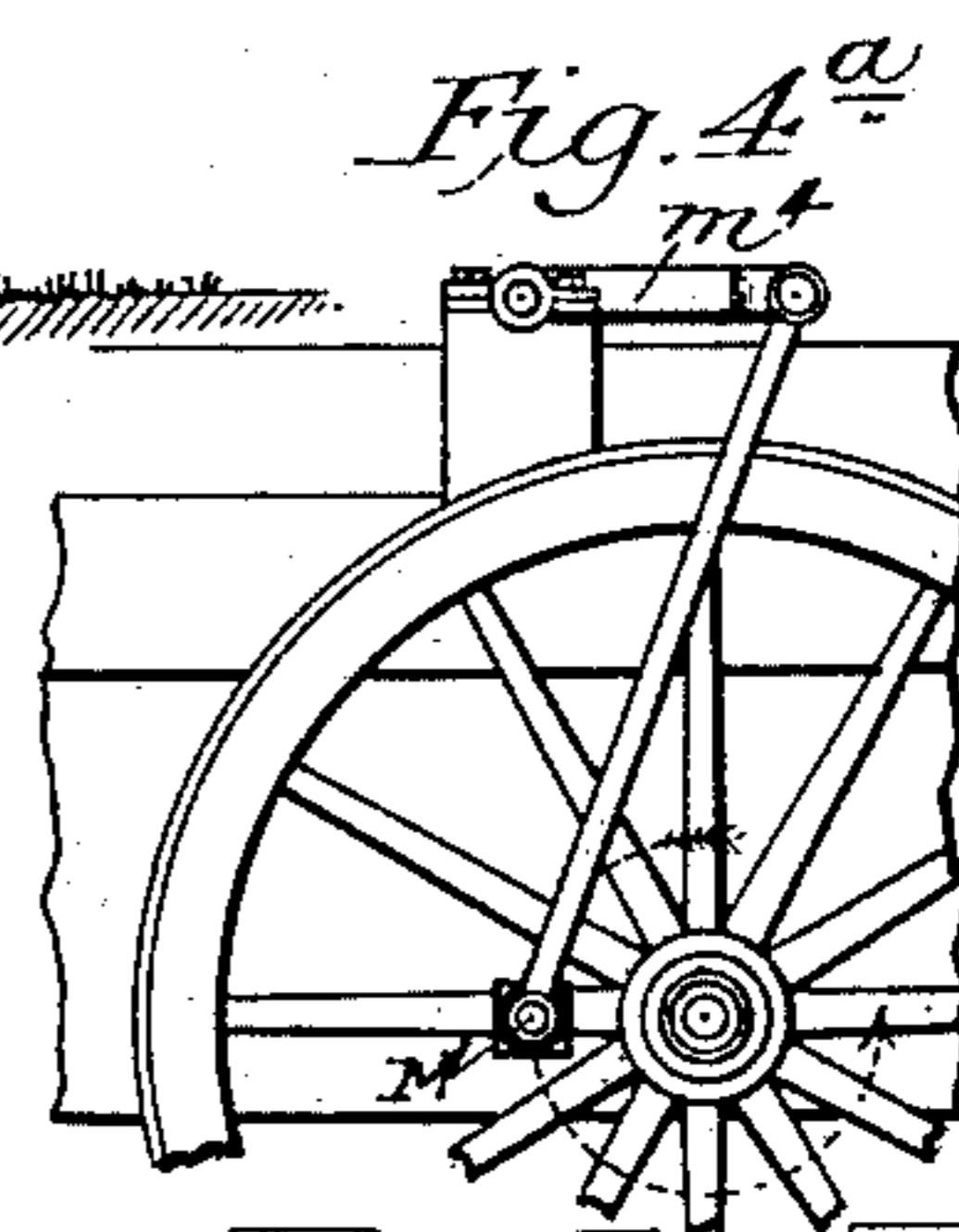
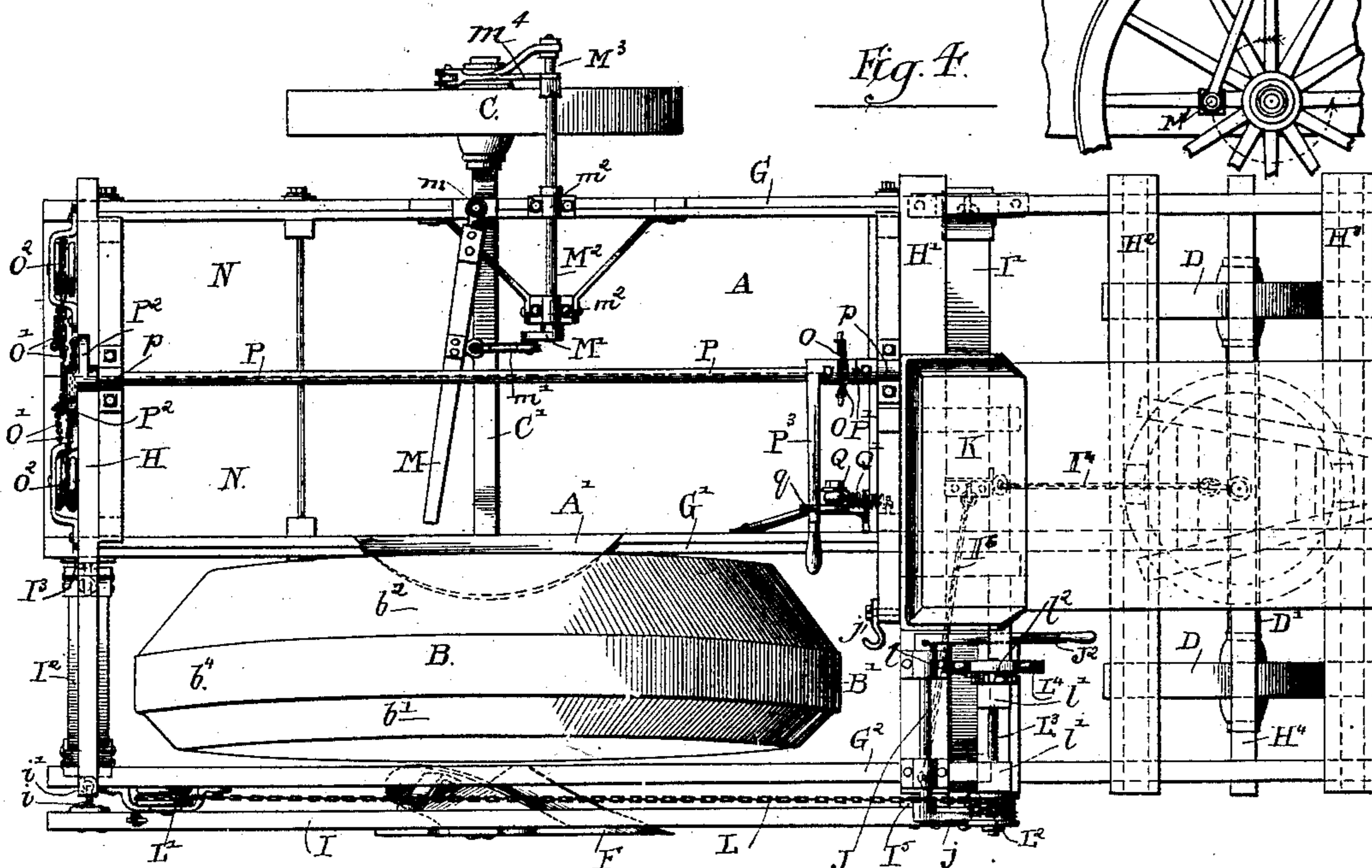


Fig. 4.



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3 Sheets—Sheet 3.

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Fig. 7.

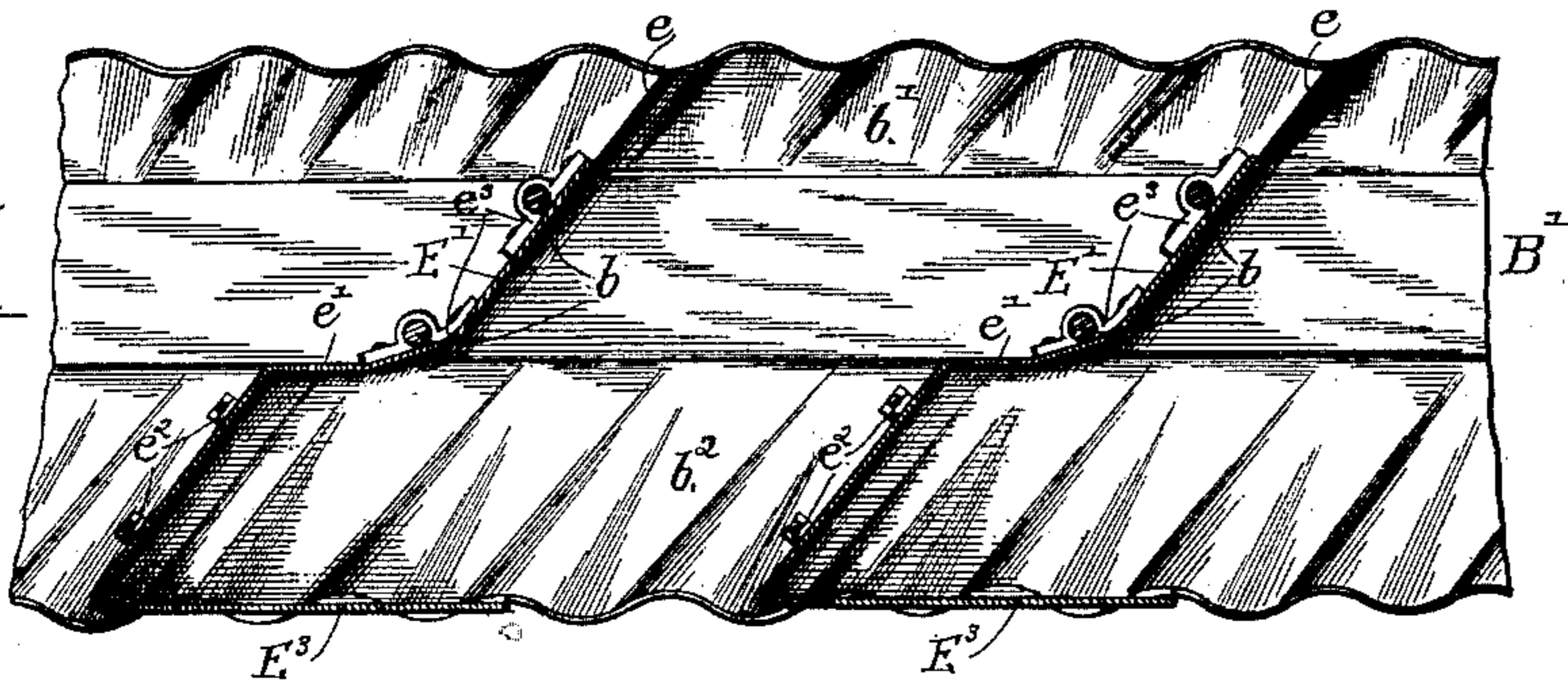


Fig. 5.

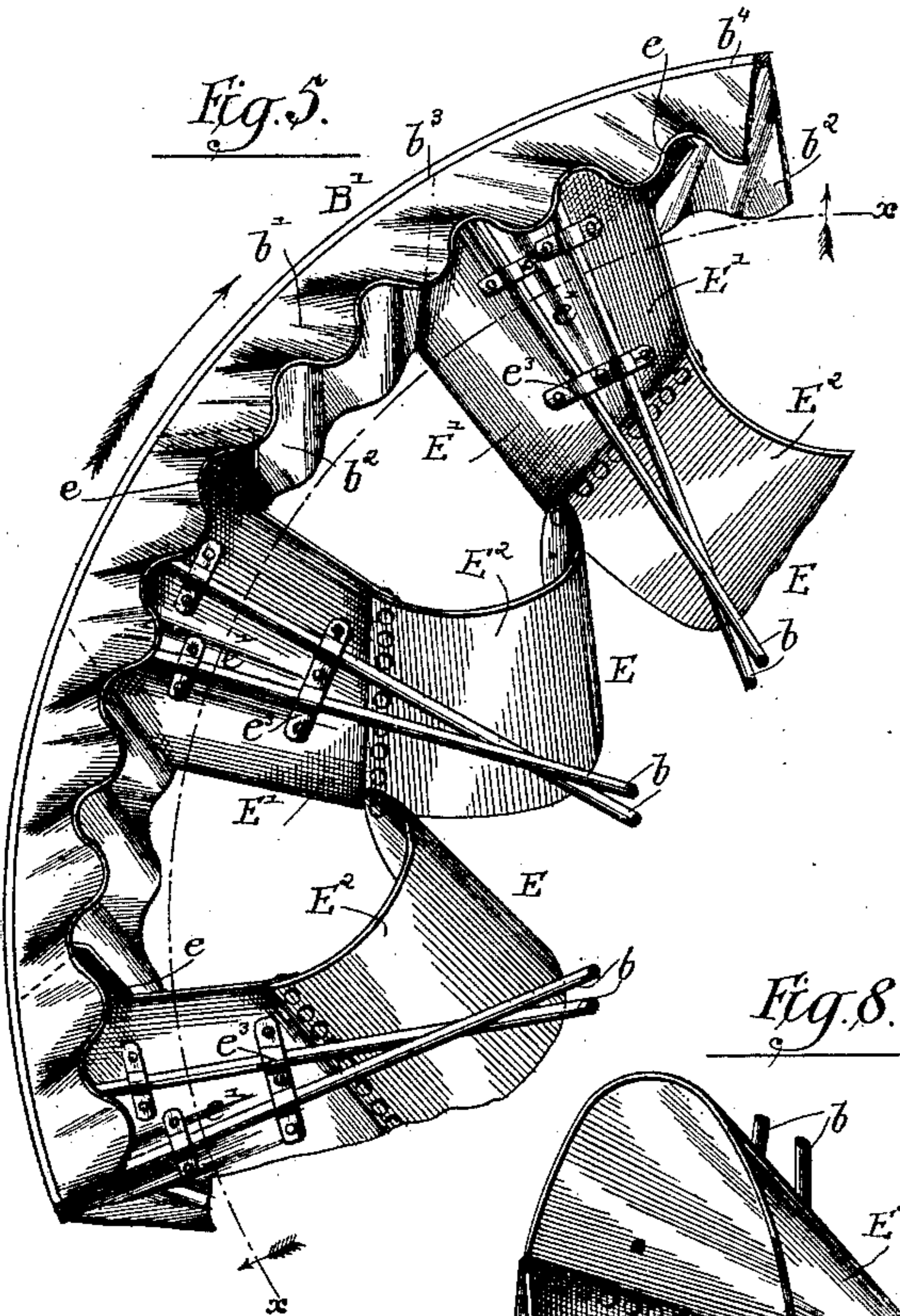


Fig. 6.

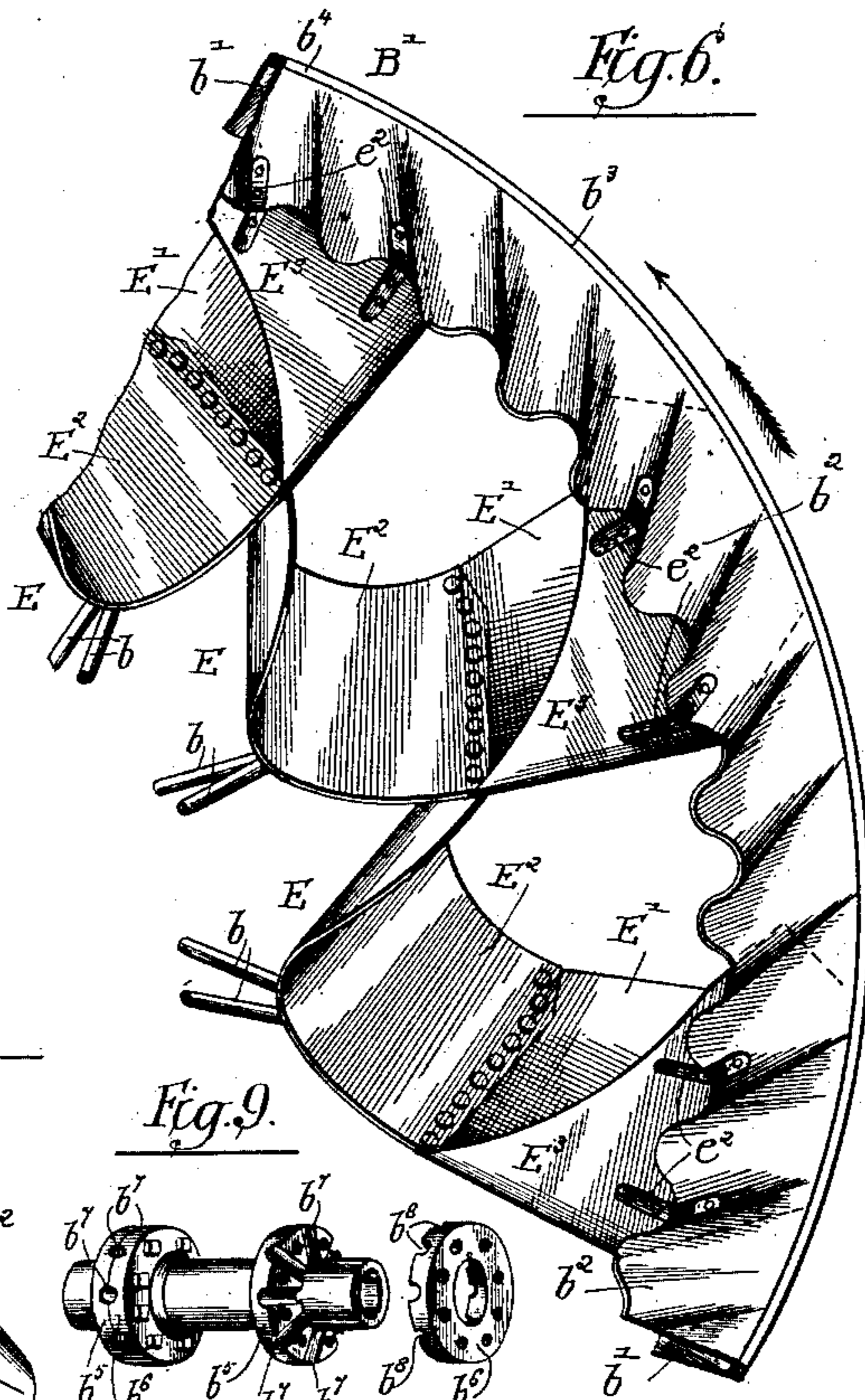


Fig. 8.

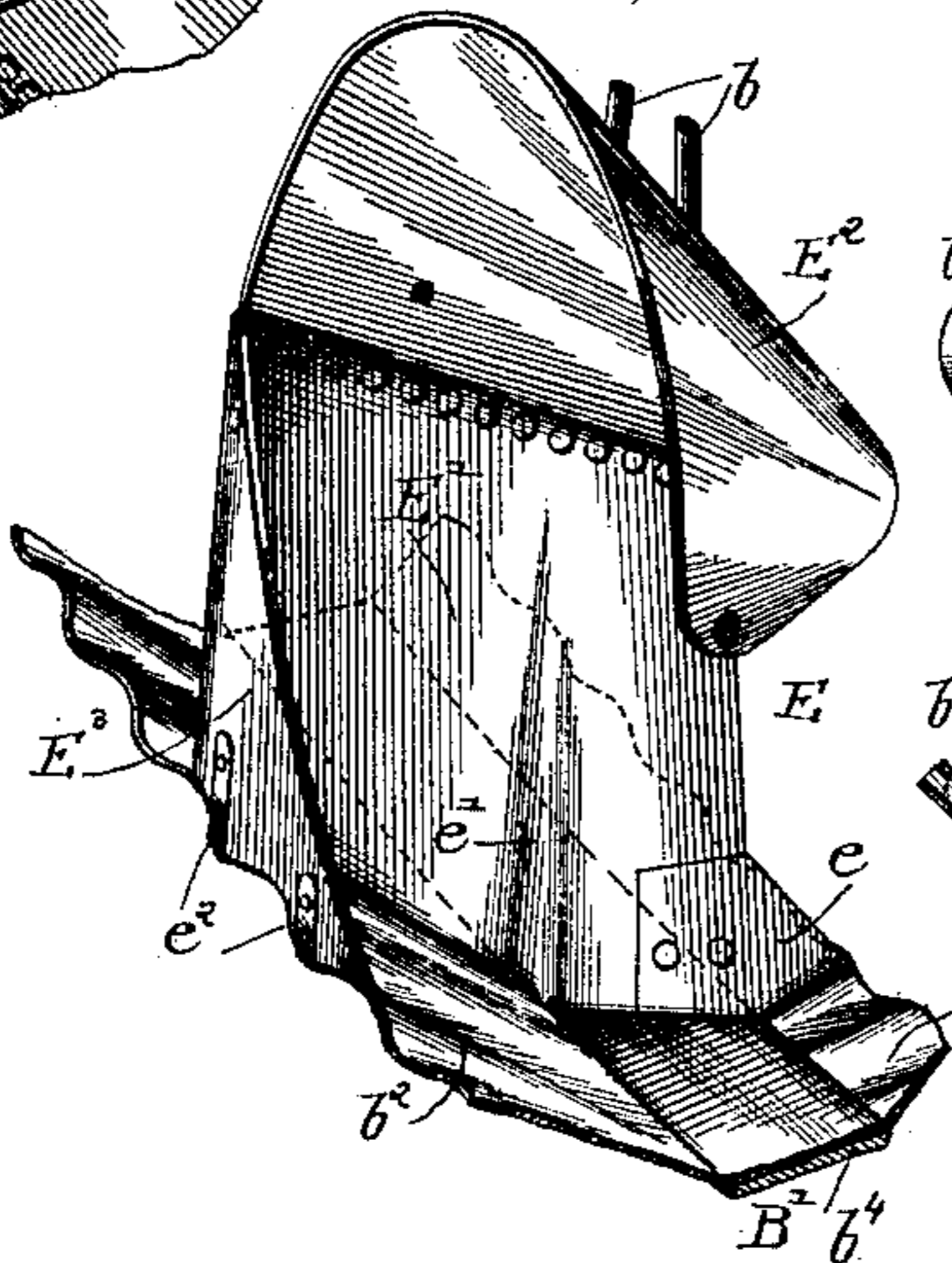


Fig. 9.

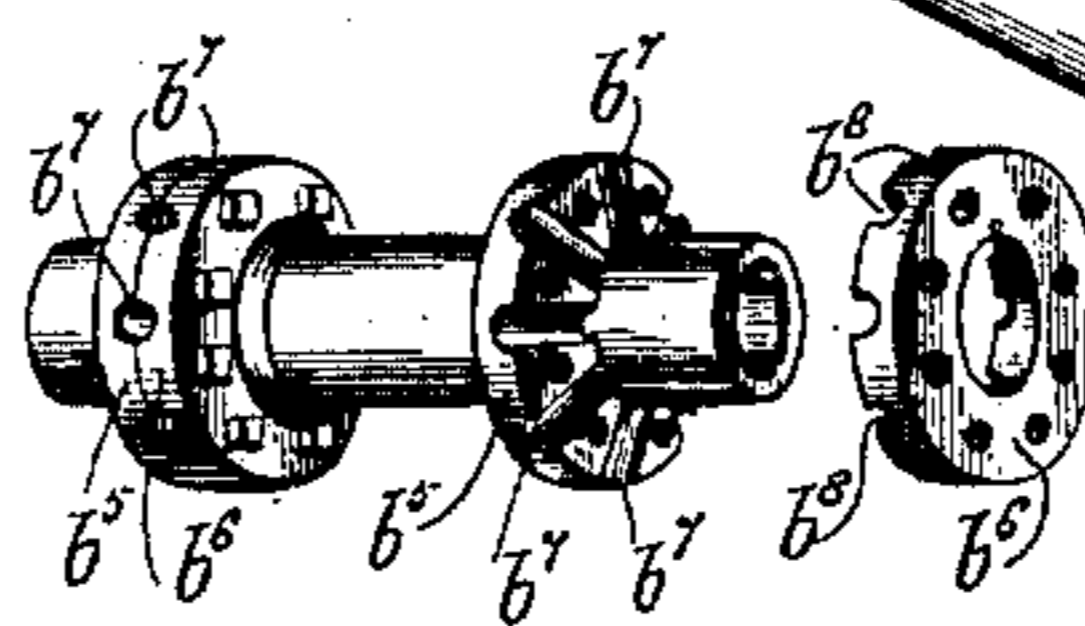
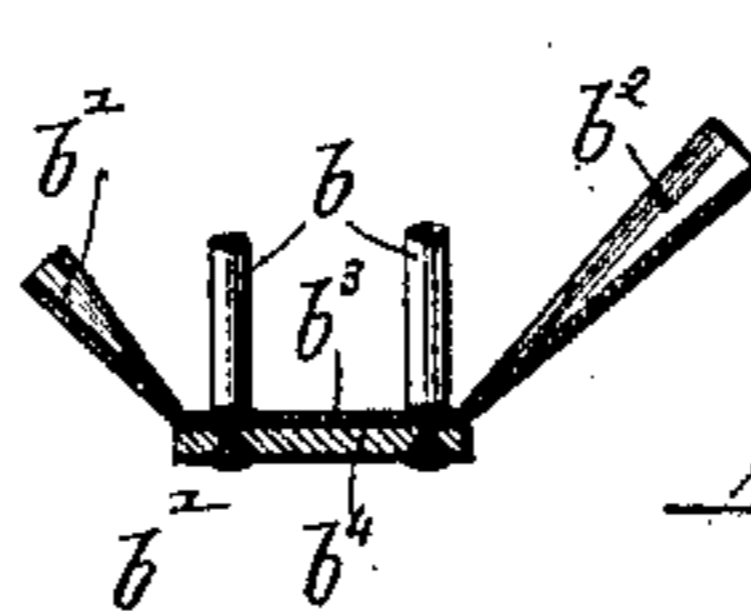


Fig. 10.



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UNITED STATES PATENT OFFICE.

ALEXANDER M. WOOLFOLK, OF CHICAGO, ILLINOIS.

EXCAVATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 360,548, dated April 5, 1887.

Application filed June 8, 1886. Serial No. 204,439. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER M. WOOLFOLK, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Excavating Devices; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

In a prior patent, No. 322,881, granted to me upon the 21st day of July, 1885, I have shown and described a device adapted for elevating material and discharging it into a wagon or other traveling receptacle, said device comprising, essentially, a wheel provided about its periphery with a series of receptacles or buckets arranged to receive and hold material which may be placed within them when adjacent to the ground, and which are so shaped as to discharge into the wagon or receptacle the material contained therein when they are brought to the top of the wheel in its forward movement. I have in said patent also described a device for unloading wagons, comprising two hinged flaps forming the bottom of the wagon body, which flaps are held closed by devices permitting them to be readily released and allowed to fall for the discharge of the load.

Among the objects of this invention are to provide an improved construction in lifting-wheels of the character above mentioned and in dumping devices for wagons; and to these and other ends, as will hereinafter appear, the invention consists in the matters hereinafter described, and pointed out in the appended claims.

The invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a wagon and lifting-wheel embodying my invention. Fig. 2 is an end view of the same. Fig. 3 is a transverse section taken upon line *xx* of Fig. 1. Fig. 4 is a plan view of the same. Fig. 4^a is a detail view illustrating devices for actuating the paddle M. Fig. 5 is a detail view illustrating the construction of the buckets of the wheel, showing said buckets as viewed from the exterior of the wheel, and the wheel-

rim is provided with corrugated flanges. Fig. 6 is a similar view showing a part of the inner face of the wheel. Fig. 7 is a detail fragmentary elevation of a part of the rim of the wheel when viewed from the interior of the latter, showing several of the buckets in sectional view, taken upon line *xx* of Fig. 5. Fig. 8 is a perspective view of a part of the wheel-rim and one of the buckets thereon. Fig. 9 is a detail perspective view of the hub of the wheel B, shown in the other figures of the drawings. Fig. 10 is a transverse sectional view of the wheel-rim.

As illustrated in the said drawings, A indicates the wagon body or earth-receptacle; B, the lifting-wheel located at one side of the receptacle; C, a supporting-wheel located opposite the lifting-wheel and mounted upon one end of a transverse axle, C', attached to the longitudinal timbers of the wagon-frame and affording bearings also for the lifting-wheel B.

D D are forward supporting-wheels, herein shown as mounted upon an axle, D', located beneath and supporting the front end of the wagon-frame.

The wheel B is provided about its periphery with a series of receptacles or buckets, E, and connected with the wagon-frame exterior to said wheel B is a plow, F, constructed to deliver material to the buckets of the wheel, in the manner hereinafter fully set forth.

As an improved construction in the wheel B and the buckets E therein, said parts are made as follows: Said wheel is preferably made of metal and is provided with broad annular rim B', connected with the hub B² by means of spokes *b*, and provided with outwardly and inwardly projecting conical flanges *b'* *b''*, making the said rim of concave or trough shape upon its inner surface, the flanges *b'* being constructed to receive the earth lifted and thrown laterally thereon by the plow F, and the flange *b''* being constructed to form the outer walls of the series of buckets E, attached upon the said annular rim of the wheel. The rim B', provided with two conical flanges, as above described, may be formed or constructed of sheet metal in any desired or preferred manner. As shown in Figs. 1 to 4, said flanges are conical and smooth, and are made or built of sheet metal in any convenient or desired manner. A preferred construction in the

flanges is shown in Figs. 5 to 8, in which said flanges are corrugated or fluted transversely with flutes extending outwardly from the middle cylindric part of the tire and made deepest adjacent to the edges or rims of the flanges, such flutes or corrugates taking up or shortening the metal at the edge of the flanges, so as to enable said flanges and the intermediate cylindric portion of the wheel to be formed of a single cylindric piece of sheet metal, thereby greatly cheapening and simplifying the process of manufacture.

The cylindric part b^3 of the wheel-rim B' is preferably made no wider than necessary to give a suitable annular bearing-face in contact with the ground, and said face is, as shown, covered by a metal ring or tire, b^4 , for stiffening the rim and preventing the wearing through of the metal forming the body of the wheel.

In the particular construction of the buckets herein shown, said buckets consist generally of a wall, E' , placed radially with reference to the axis of the wheel and extending obliquely across the inner face of the wheel-rim from the outer edge of the flange b' to the rim-margin of the flange b^2 , and an inner wall, E^2 , united at one edge with the wall E' and extending in curved form to the corresponding wall E' of the next adjacent bucket, said wall E^2 being inclined or sloped inwardly and toward the center of the wheel, so as to form a chute operating to deliver the material in the bucket laterally into the wagon-body or receptacle when said bucket reaches the upper part of the wheel. The part or edge of the said wall E' adjacent to the outer flange, b' , is located in advance of the edge of said wall adjacent to the conical flange b^2 , having reference to the direction of motion of the wheel when the latter turns upon its axis, so that said wall E' , together with the concave or hollow inner surface of the wheel and the inner wall, E^2 , forms a receptacle or bucket adapted to hold or retain material thrown upon or into the trough-shaped rim of the wheel as the bucket rises in the forward movement of the wagon, the mouth or opening of the bucket or receptacle obviously being at the side of the bucket which is toward the rear of the wagon when the bucket is at the lower part of the wheel or adjacent to the ground.

The main part of the wall E' of the bucket is preferably terminated at or about a vertical plane passed through the outer edge of the cylindric part b^3 of the wheel-rim, a part, e , of said wall adjacent to the said rim only being extended to the outer edge of the conical flange b' . Said part e is, as shown, of triangular shape, and is adapted to deflect or throw inwardly any material cast upon the said flange b' as said material slides backward upon the flange in the upward movement of the bucket. The several buckets are preferably provided, also, with a third wall, E^3 , located in the plane of the inner face of the wheel and forming an inward extension of the flange b^2 ,

said walls E^3 being attached to the edge or margin of the said flange b^2 and to the inner margin of the bucket-wall E' , said wall E^3 serving to give increased capacity to the bucket, and also to prevent the discharge of the material therefrom before the bucket is inverted upon reaching the top of the wheel.

The buckets constructed as above set forth are located at short distances apart upon the wheel-rim, and in the operation of the device material thrown in or upon the said rim between the buckets will, when the rim assumes an inclined position in the rotation of the wheel, slide downwardly and into the said buckets. The walls E' of the buckets, which are set obliquely upon the rim, as above set forth, are obviously inclined in such manner that as the buckets are rising with the wheel the said walls slope downwardly and inwardly, so that the material falling into the buckets will slide downwardly upon said walls E' toward the inner part of the wheel and adjacent to the point at which it is discharged.

The walls E' of the buckets may extend in a straight line across the wheel-rim; but, preferably, said walls are provided with double bends in their middle parts, so as to form offsets e' and to bring the inner parts of the walls E' , or those which are over or attached to the flange b^2 , to the rear (referring to the direction of motion of the bucket) of the outer parts of said walls E' , this construction obviously giving a greater capacity in the buckets, and bringing their main parts, in which the bulk of the material is held, over or upon the flange b^2 and adjacent to the discharge side of the buckets and wheel. The said offsets, as herein shown and preferably constructed, are located at the line of the intersection of the cylindric part b^3 of the rim with the inner conical flange, b^2 ; but this exact location of said offsets is obviously not essential to the general results stated.

The inner walls or chutes, E^2 , of the buckets, instead of being placed at right angles to the plane of the wheel, are preferably arranged obliquely thereto in such manner that when the buckets are at the top of the wheel the chutes are directed toward the rear of the apparatus, as well as inwardly and downwardly. By this construction the material is discharged from the buckets so as to enter the wagon-body or receptacle at a point opposite the center of the wheel, the rearward inclination of the chutes obviously tending to cause the deposit of the material at the point mentioned, notwithstanding the forward impetus given to the earth or dirt by the revolution of the wheel. The construction of the chutes E^2 with a rearward inclination is obviously facilitated by the oblique position of the walls E' of the buckets, which enables the edges of the chutes to be attached thereto in such manner that the said chutes and the walls form smooth curves, as clearly shown in Figs. 6, 7, and 8.

When the annular rim of the wheel is corrugated, as illustrated in Figs. 5 to 8, the cor-

rugates or flutes are preferably arranged obliquely or inclined, with reference to the edges of the wheel, in the same general direction as the walls E' of the buckets, so as to deflect or direct the material thrown upon said flange inwardly toward the middle part of the wheel-rim and into the buckets as the buckets rise with the rim in the revolution of the wheel, in an obvious manner. The corrugations in the inner flange, b^2 , of the wheel I preferably incline in the same direction as the corrugations in the outer flange, as clearly shown in Fig. 5, said corrugations obviously tending to carry the material resting on the inner face of the said flange toward the inner or discharge side of the buckets, and to thereby facilitate the delivery of said material when the buckets are reversed at the top of the wheel.

In the particular construction of the wheel herein illustrated the walls E^3 of the buckets are made in one piece with the walls E' , and said walls E' and E^3 are attached at their edges to the wheel by means of angle-irons e^2 , secured by rivets to the walls of the buckets and rim, and are also attached to the spokes b of the wheel by means of metal straps or clips extending around the said spokes and riveted or bolted to the walls of the buckets. The said spokes b are preferably made of steel rods and arranged in pairs and crossed, so as to brace the wheel laterally, the connection of the said spokes with the buckets by means of the clips e^3 e^4 obviously tending to greatly stiffen and strengthen the parts. The outer parts, e , of the bucket-walls E' are shown as formed by pieces of metal overlapping the said walls E' , and secured thereto by the same bolts by which the clips e^3 adjacent to the wheel-rim are attached to the buckets. The clips e^3 at the inner part of the buckets are preferably made double, or in such manner as to embrace both spokes of each pair of spokes, so as to rigidly connect the spokes with each other and with the buckets, and thereby greatly increase the strength and stiffness of the parts.

As far as the general features of construction above described are concerned, the said spokes b may be attached in any suitable manner to the wheel rim and hub. As a preferred means of connecting the spokes with the rim, however, said spokes are reduced in diameter or shouldered at their outer ends and inserted through apertures in the part b^3 of the rim and the tire b^4 , the reduced parts being headed or riveted upon their outer ends, as clearly shown in Fig. 10, so as to hold the outer ends of said spokes firmly in the rim, while at the same time affording a convenient means of attaching the tire b^4 to the wheel.

In order to provide a construction in the hub B^2 whereby the inner ends of the spokes may be conveniently attached thereto, the said hub is shown in Fig. 3, and more clearly in the detail perspective view, Fig. 9, as provided with two annular flanges, b^5 , cast integral therewith, and with separate annular

rings or collars b^6 , which are bolted against the outer faces of said flanges over the inner ends of the spokes, the flanges and collars being provided with opposite depressions b^7 b^8 , forming, when the parts are placed together, a series of recesses to receive the said inner ends of the spokes. The said recesses are preferably made slightly larger than the diameter of the spokes, and the latter are secured therein after the rings or collars have been secured to the flanges by pouring Babbitt or other readily-fusible metal into the recesses about the spoke ends.

To insure the delivery of the material delivered from the buckets, shaped as above described, to the wagon-body A, the side wall of said wagon-body adjacent to the wheel B is located close to the latter, and is preferably provided with a deflecting-plate, A' , Figs. 3 and 4, attached to the upper edge of the side wall and inclined upwardly and outwardly, with its upper edge beneath the inner or discharge ends of the inclined walls or chutes E^2 of the buckets, so as to receive and deflect inwardly to the wagon-body material falling from the said buckets.

To further facilitate the delivery of material from the several buckets into the wagon-body I preferably incline the end of the wheel-axle C' , supporting the wheel B, in such manner as to throw the top part of the wheel nearer the wagon-body than that portion of the wheel which rests upon the ground, as clearly shown in the drawings, Figs. 2 and 3, this construction obviously bringing the buckets from which the material is being discharged more nearly over the wagon-body, so as to require less lateral movement of the said material to bring it into said body.

A wheel-hub constructed as above described is of particular advantage for use in connection with the wheel constructed in the manner shown, inasmuch as a means is thereby provided whereby the inner ends of the spokes may be readily secured to the hub after their outer ends have been attached to the wheel-rim by riveting in the manner above stated. It will of course be understood that the outer reduced ends of the spokes may or may not extend through the tire b^4 ; but the construction shown is preferred, inasmuch as it enables other attaching devices to be dispensed with.

One convenient construction in the frame of the wagon, whereby the plow may be conveniently connected with and drawn therefrom, and in means for movably supporting the plow thereon, is herein shown, and is as follows: The wagon-frame consists generally of three longitudinal bars or frame-pieces, G G' G^2 ; the frame-pieces G G' being located at each side of the body A of the wagon, and the frame-piece G^2 being located outside of the wheel B. Said longitudinal pieces G G' G^2 are connected at the rear of the frame by a cross-piece, H, and at its forward end by other cross-pieces, H' H^2 H^3 , and also by means of

cross-pieces H^1 H^2 H^3 , located beneath the forward ends of said beams, said cross-pieces being constructed to rest upon a fifth-wheel, D^2 , by means of which they are connected with the front axle. The plow F is located exterior to the wheel B , and may be connected with the frame either in the particular manner shown and hereinafter described or otherwise. In the prior patent hereinbefore referred to as having been granted to me, an apparatus is shown comprising a wagon-body, lifting-wheel, and plow arranged generally as herein shown. In said prior patent, however, the front axle is shown as pivoted in line with the center of the wagon-body, thus making it inconvenient, on account of the resistance of the plow and lifting-wheel, to draw the entire apparatus by horses attached to the said front axle, and making it necessary to employ a horse or horses in front of the plow. As an improvement in this part of the device I pivot the front axle, D' , to the frame at a point approximately in alignment with the center of resistance of the entire machine, thus avoiding any side draft and enabling all the horses necessary to draw the body, wheel, and plow to be harnessed at the pole in the usual manner. In the particular construction of the frame illustrated, the king-bolt and fifth-wheel are shown as located beneath the forward part of said frame about midway between the longitudinal frame-pieces G and G^2 ; but in practice the axle may be shifted laterally upon the frame to bring it opposite the center line of draft, as may be found necessary or desirable. The plow F is attached to a horizontal beam, I , arranged outside of the wheel B , parallel with and below the frame-piece G^2 , said beam I being connected with the wagon-frame at its front end by means of a transverse beam, I' , having pivotal connection at one end with the said plow-beam and at its opposite end with one of the longitudinal beams, as G , of the frame. The rear end of the plow-beam I is similarly connected with the frame by a beam, I^2 , sustained upon the frame by a depending arm or bracket, I^3 , attached to the rear end of the frame-piece G' . Both of the transverse beams I' I^2 are connected at their ends with the plow-beam and wagon-frame by joints permitting the free movement of the beam in all directions, said joints being formed, as herein shown, by metal eyes i i' , engaged with each other and secured to the said frame and cross-beams in the manner illustrated. The connection between the plow-beam I and the frame obviously permits a free movement of both ends of the said beam both vertically and longitudinally, while holding the beam parallel with the wagon-frame. Suitable draft-connections for the plow may be attached to the beam thus constructed and attached in any manner found convenient or desirable—as, for instance, a horse or horses may be attached to the plow-beam independently of the wagon-frame, or said beam may be connected with and drawn from the frame. The

latter construction is usually preferred, and is herein shown, a chain, I^4 , for this purpose being attached to the middle of the forward transverse beam, I' , and to the front axle behind or in alignment with the king-bolt, so that the draft applied to the forward axle is transmitted directly to the said transverse beam of the plow.

To hold the plow and beam connected with the wagon in the manner described from tipping sidewise under the outward pressure of the earth upon the mold-board of the plow, I provide said plow-beam with an upwardly-projecting arm, I^5 , the upper end of which is constructed to extend past and rest against the outer face of the longitudinal frame-piece G^2 . I further connect the upper end of said beam I^5 with the middle part of the cross-piece I' by means of a chain, I^6 . By this construction any tipping or twisting of the plow-beam in either direction is obviously prevented, and the plow is held firmly to its work, while at the same time being free to move vertically, so that it may be adjusted to the depth required.

One convenient form of adjusting devices for regulating the vertical position of the forward and rear ends of the plow-beam is shown in the accompanying drawings, in which the means for controlling the front end of the beam comprises a horizontal transversely-arranged rock-shaft, J , mounted upon the forward part of the frame slightly in advance of the wheel B , and provided with a forwardly-projecting arm, j , at its outer end, connected with the front end of the plow-beam I by means of a vertical connecting-bar, J' . Upon the opposite or inner end of the said rock-shaft is attached a hand-lever, J^2 , extending upwardly at one side of the driver's seat, K , herein shown as located upon the wagon-frame in front of the body A . By throwing the lever J^2 forward, the end of the plow-beam will obviously be thrust downwardly or depressed, and by pulling it backward the said forward end of the beam may be lifted. A suitable stop or hook, j' , will preferably be attached at a convenient place upon the frame to engage the lever J^2 , for holding the forward end of the plow-beam in its elevated position. As herein shown, said stop or hook j' is pivoted to the frame supporting the seat in position to engage a hand-lever, J^2 , when the latter is thrown toward the rear of the apparatus. Said hand-lever J^2 may be, desirably, provided at one side with a horizontal arm or stirrup, j^2 , upon which the foot of the driver may be placed when the lever is thrown forward, so that he may force the point of the plow into the ground, when necessary, without the use of the hand for this purpose.

For lifting the rear end of the plow-beam I I have provided a chain, L , which is attached to the rear end of the beam and passes upward over a guide-pulley, L' , upon the rear part of the frame-piece G^2 , and then forward, and is wound upon a drum, L^2 , which drum is mounted upon a shaft, L^3 , located adjacent to the

driver's seat K, and provided with a handled turning-wheel, L^4 , whereby the shaft may be rotated for winding up the chain and lifting the beam. A ratchet-ring, l , is preferably provided upon one of the standards l' , supporting the shaft L^3 , engaged with a pawl, l^2 , upon the wheel L^4 , whereby the shaft may be held from turning when the plow-beam is lifted. By the use of the lifting devices connected with the front and rear end of the plow-beam, as above described, the plow may obviously be conveniently lifted and sustained above the ground when the wagon is being moved from place to place.

M, Figs. 2, 3, and 4, is a horizontally-reciprocating bar or paddle, acting as a distributor for thrusting sidewise and distributing in the wagon-body the material falling from the buckets upon the deflecting-plate A^2 . Said arm or paddle is, as shown, pivoted at m upon the wagon-frame, and extends over the wagon-body with its free or swinging end adjacent to the said deflecting-plate A^2 , and a reciprocatory motion is given to the said arm by means of a crank, M' , attached to a rock-shaft, M^2 , and connected with the said arm by a connecting-bar, m' . Said shaft M^2 is mounted in suitable bearings, m^2 , upon the machine-frame, and is actuated by a crank-pin, M^3 , upon the supporting-wheel C, connected by means of a pitman, m^3 , with the free end of the arm m^4 upon the said shaft, so as to give an oscillatory movement to the shaft and the crank M' as the wheel is turned in the forward movement of the machine, as clearly shown in the detail view, Fig. 4^a.

It is obviously inconvenient to construct a wagon provided with loading devices, such as above described, in a manner to permit of its being tilted for the purpose of discharging the load therefrom, and to provide means for readily dumping or discharging the material deposited therein by the loading-wheel I provide the wagon-body with two downwardly-opening flaps, N, which are hinged at n to the lower edges of the side walls and meet at the middle line thereof when closed. The said flaps are held in closed position by means of chains O O', connected with and operated by arms P' P^2 upon a rock-shaft, P, arranged longitudinally over the middle of the wagon-body and supported in bearings p , attached to suitable cross-pieces upon the wagon-frame. The said rock-shaft P is provided with a lever-arm, P^3 , whereby the shaft may be turned for opening and closing the flaps N N, the parts above described operating in a manner generally similar to the corresponding parts shown in the said prior patent.

At the forward end of the wagon-body the chains O are attached at their upper ends to a single arm, P' , upon the rock-shaft P; but the chains O' at the rear end of the body, instead of passing directly to the rock-shaft, are trained over guide-pulleys O^2 O^2 at either side of the wagon-body, and extend from said guide-

pulleys to the two arms P^2 P^2 , which are arranged at an angle with each other, as shown, and in such manner that when the shaft is turned into position to close the flaps said arms will extend from the shaft in directions opposite to or away from the pulleys O^2 O^2 , as clearly shown in the drawings, Fig. 2. The location of the said arms P^2 at an angle with each other, as shown, is obviously necessary, in order that both flaps may be lifted equally in the rotary movement of the rock-shaft.

The wagon-body, as herein shown and preferably constructed, is made without any rear wall or tail-board, so that when the flaps are opened to dump the load the wagon may be readily driven past or over the deposited material, and the guide-pulleys O^2 O^2 are employed for the purpose of holding the chains at the sides of the wagon-body when the flaps are opened, so that said chains will not encounter the pile or mound of material deposited by the wagon in the forward movement of the latter.

I preferably locate the lever-arm P^3 , by which the rock-shaft P is turned, at the forward end of said rock-shaft and at a point adjacent to the driver's seat, and I so arrange said arm that it stands in an approximately horizontal position when the flaps N N are closed. For holding the arm in this position a vertical detent-lever, Q, is preferably pivoted upon the wagon-frame, said lever having upon it a laterally-extending projection or tooth, q , adapted to engage and hold the said lever-arm P^3 in its horizontal position. Said detent-lever Q is held by a spring, Q' , in a position to engage the arm P^3 , and the projection q is inclined upon its upper face, so that when encountered by the arm P^3 in the downward movement of the latter the detent-lever will be thrust backwardly to permit the arm to pass the said projection q , and will then be thrown forward by the spring Q' , so as to become automatically engaged with the lever-arm. By moving the said detent-lever Q so as to release the arm P^3 the flaps may obviously be released and the load instantly dumped at a desired point without other attention on the part of the operator.

A lifting-wheel embodying the novel features of construction above set forth may obviously be employed in connection with excavating machines or devices of other kinds than those embracing a wagon-body or receptacle as part of the structure.

I claim as my invention—

1. A lifting-wheel having a trough-shaped rim, consisting of a central cylindric part and two conical flanges, and a series of buckets located upon the inner surface of said rim, substantially as described.

2. A lifting-wheel having a trough-shaped rim, the marginal parts of which are corrugated, and a series of buckets located upon the inner face of the rim.

3. A lifting-wheel having a trough-shaped rim, consisting of a central cylindric part and two conical flanges, said flanges being corru-

gated, and a series of buckets located upon the inner surface of the rim, substantially as described.

4. A lifting-wheel having a sheet-metal rim provided with one or more conical flanges formed by corrugating the marginal part of a metal sheet composing the rim, substantially as described.

5. A lifting-wheel provided with a trough-shaped rim having a conical flange, b^2 , at its inner or discharge side, said wheel being provided with a series of buckets, the open sides or mouths of which face rearwardly when the buckets are at the bottom of the wheel, which buckets are provided with walls E' , arranged obliquely upon the rim and extending over or across the conical flange b^2 to the inner edge or free margin of said flange, substantially as described.

6. A lifting-wheel having a rim provided with a conical flange upon its outer edge, and a series of buckets located upon the rim with their open sides or mouths facing rearwardly when the buckets are at the bottom of the wheel, said conical flange being corrugated obliquely, whereby material cast upon the flange is directed inwardly toward the buckets, substantially as described.

7. A lifting-wheel having a rim provided with a conical flange upon its inner edge, and a series of buckets located upon the rim and flange with their open sides or mouths facing rearwardly when the buckets are at the bottom of the wheel, said flange being corrugated obliquely, whereby material resting thereon is carried toward the exit side of the buckets and its delivery therefrom facilitated, substantially as described.

8. A lifting-wheel having a rim provided with an obliquely-corrugated conical flange at its outer edge and provided with a series of buckets, the open sides or mouths of which face rearwardly when the buckets are at the bottom of the wheel, said buckets being provided with walls E' , arranged obliquely upon the rim, substantially as described.

9. A lifting-wheel having a trough-shaped rim and provided with a series of buckets, the open sides or mouths of which face rearwardly when the buckets are at the bottom of the wheel, said buckets being provided with obliquely-arranged walls E' , and the margins of the rim being provided with oblique corrugations inclined to correspond with the wall E' , substantially as described.

10. A lifting-wheel having a trough-shaped rim and provided with a series of buckets, the open sides or mouths of which face rearwardly when the buckets are at the bottom of the wheel, said buckets comprising walls E' , arranged obliquely upon the wheel-rim and provided with offsets e' , making the buckets deepest at the inner side of the wheel, substantially as described.

11. A lifting-wheel having a rim provided with a broad inner concaved flange, b^2 , and provided with a series of buckets, the open

sides or mouths of which face rearwardly when the buckets are at the bottom of the wheel, said buckets comprising walls E' , arranged obliquely upon the wheel-rim and provided with offsets e' near the inner edge of the flange b^2 , whereby the main or deepest part of the bucket is formed upon or over the said flange b^2 , substantially as described.

12. A lifting-wheel having a series of buckets located about its periphery, said buckets being provided with inner walls or chutes, E' , which are inclined inwardly and are arranged obliquely with relation to the radial lines of the wheel, whereby the earth spilled from the buckets when they are at the top of the wheel will be directed rearwardly by the said chutes, substantially as described.

13. A lifting-wheel having a trough-shaped rim and provided with a series of buckets located upon the rim, said buckets comprising walls E' , attached to the rim obliquely thereto, and inner walls or chutes, E'' , which are inclined inwardly and are arranged obliquely with relation to the radial lines of the wheel, whereby when the buckets are at the top of the wheel the earth falling therefrom will be directed rearwardly, said chutes being attached to and forming continuations of the oblique walls E' , substantially as described.

14. A lifting-wheel having a trough-shaped rim formed by an inner piece or layer of sheet metal corrugated in its marginal portions to form conical flanges at the side edges of the rim, and having a band or tire about the middle or cylindric part of the rim, substantially as described.

15. The combination, with a wagon-body and lifting-wheel located at one side of the body, of a frame consisting of three longitudinal frame-pieces, one at each side of the wagon-body and another exterior to the lifting-wheel, cross-pieces rigidly connecting said longitudinal frame-pieces, a plow connected with the frame exterior to the wheel, and draft-connections attached centrally to the forward part of said frame, substantially as described.

16. The combination, with a machine-frame and a lifting-wheel located at one side of the frame, of a plow located exterior to the wheel, a longitudinal plow-beam, transverse beams pivotally connected with the ends of the plow-beam and with the frame, a chain connecting the forward transverse beam with the forward part of the machine-frame, and means for adjusting the vertical position of the front and rear ends of the plow-beam, substantially as described.

17. The combination, with a wagon-body and lifting-wheel, of a distributing device consisting of a horizontally-oscillating arm or paddle and a transverse rock-shaft provided with a crank-arm connected with the oscillating arm, and with a second crank-arm connected with a crank-pin upon one of the wheels of the wagon, substantially as described.

18. The combination, with a wagon-body and flaps NN , hinged thereto, of a supporting

device for the flaps, consisting of a longitudinal rock-shaft mounted over the wagon-body and provided with crank-arms, and chains connecting said crank-arms with the flaps, the
5 chains at the rear end of the wagon-body being trained over pulleys located near the sides of the body, substantially as described.

19. The combination, with the wagon-body, the flaps N N, the chains O O', and rock-shaft
10 P, provided with crank-arms for the attachment of the chains and with a lever-arm, P³, of a pivoted detent-lever, Q, provided with a

projection, q, having an inclined upper surface, and a spring applied to hold said detent-lever in position to engage said lever-arm P³, 15 substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALEXANDER M. WOOLFOLK.

Witnesses:

C. CLARENCE POOLE,
CHARLES E. FISHER.