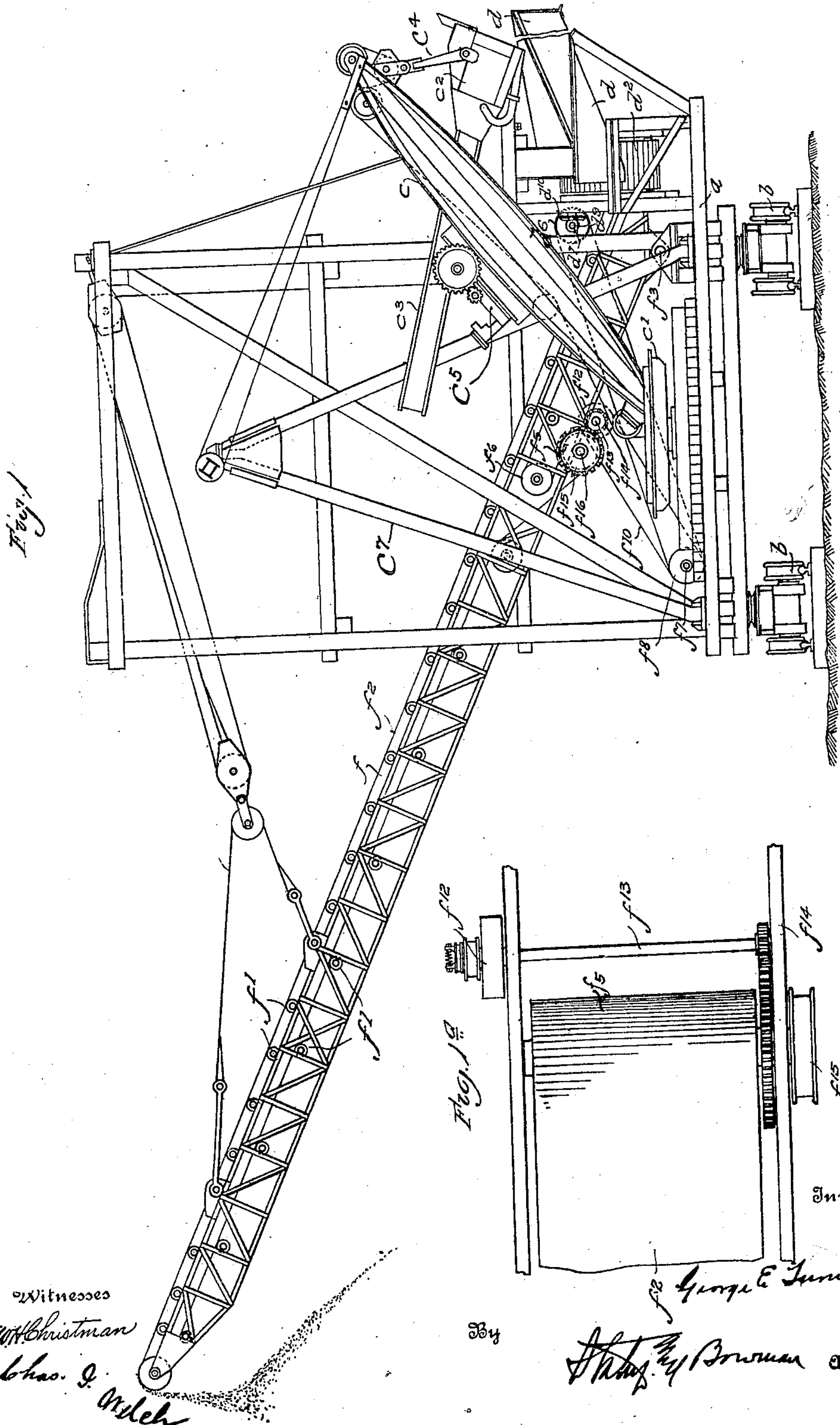


922,213.

G. E. TURNER.
STEAM SHOVEL.
APPLICATION FILED MAR. 25, 1908.

Patented May 18, 1909.
11 SHEETS—SHEET 1.



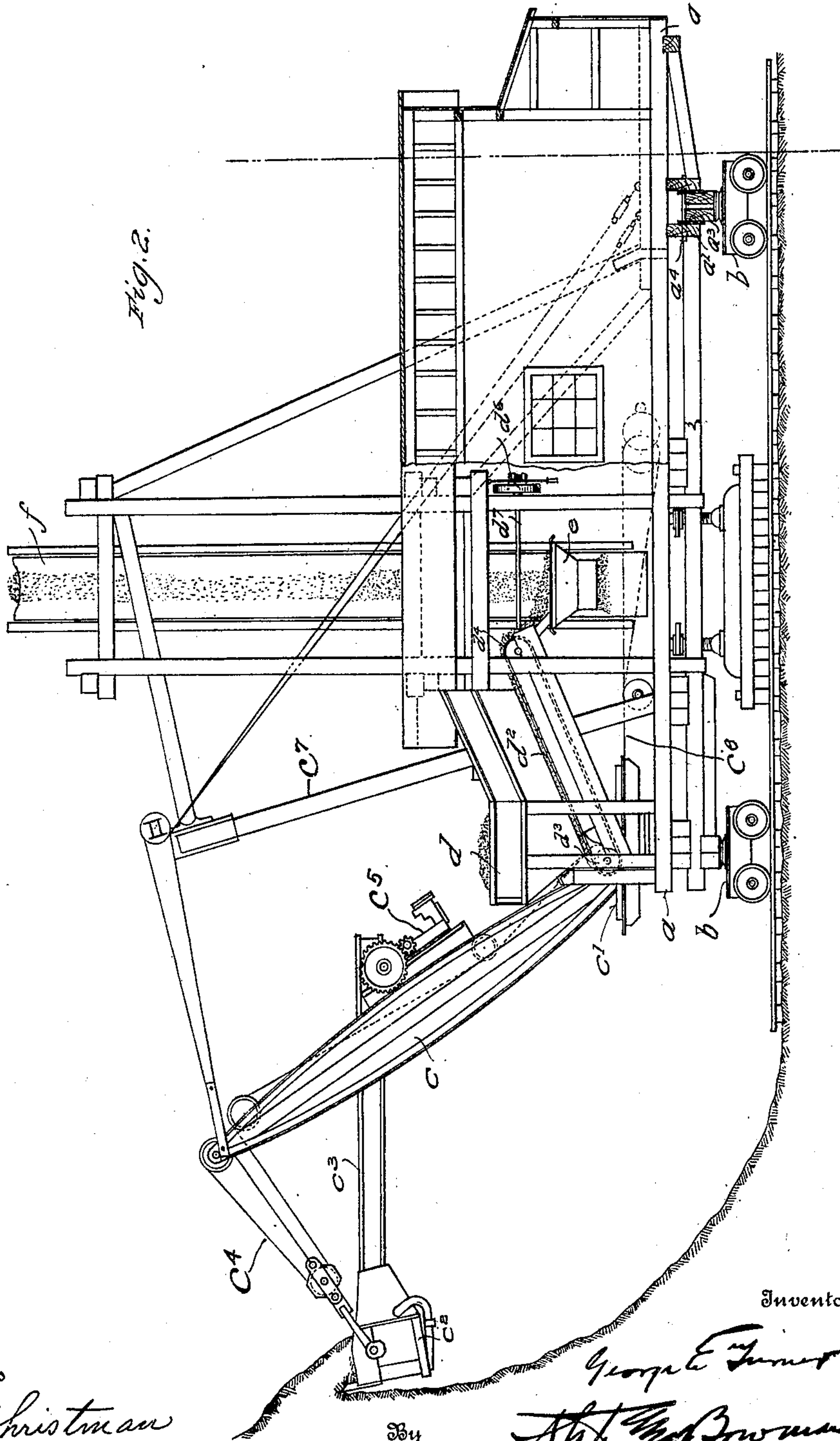
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STEAM SHOVEL.

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Patented May 18, 1909.

11 SHEETS—SHEET 2.



Witnesses

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APPLICATION FILED MAR. 25, 1908.

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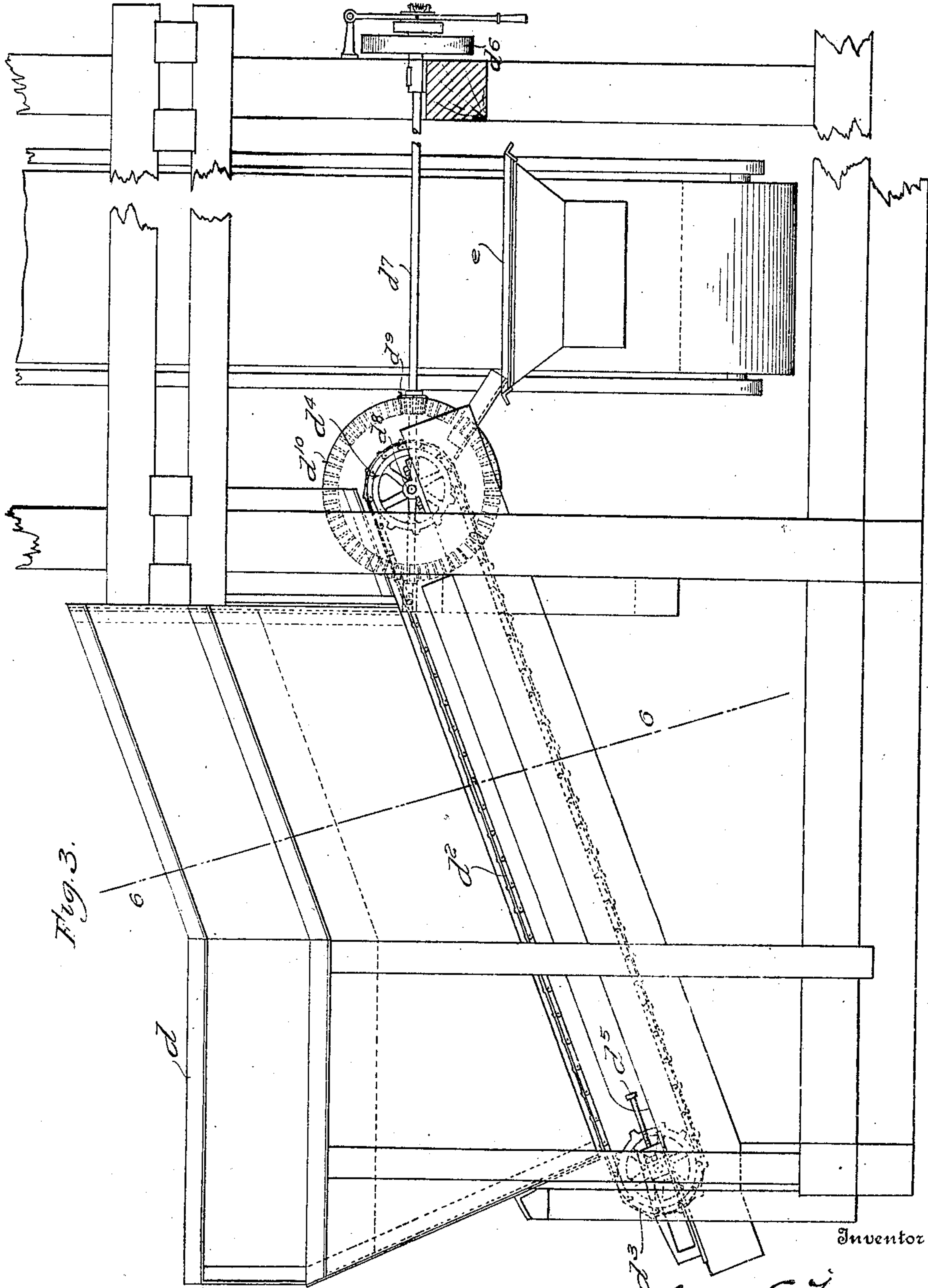


Fig. 3.

Witnesses

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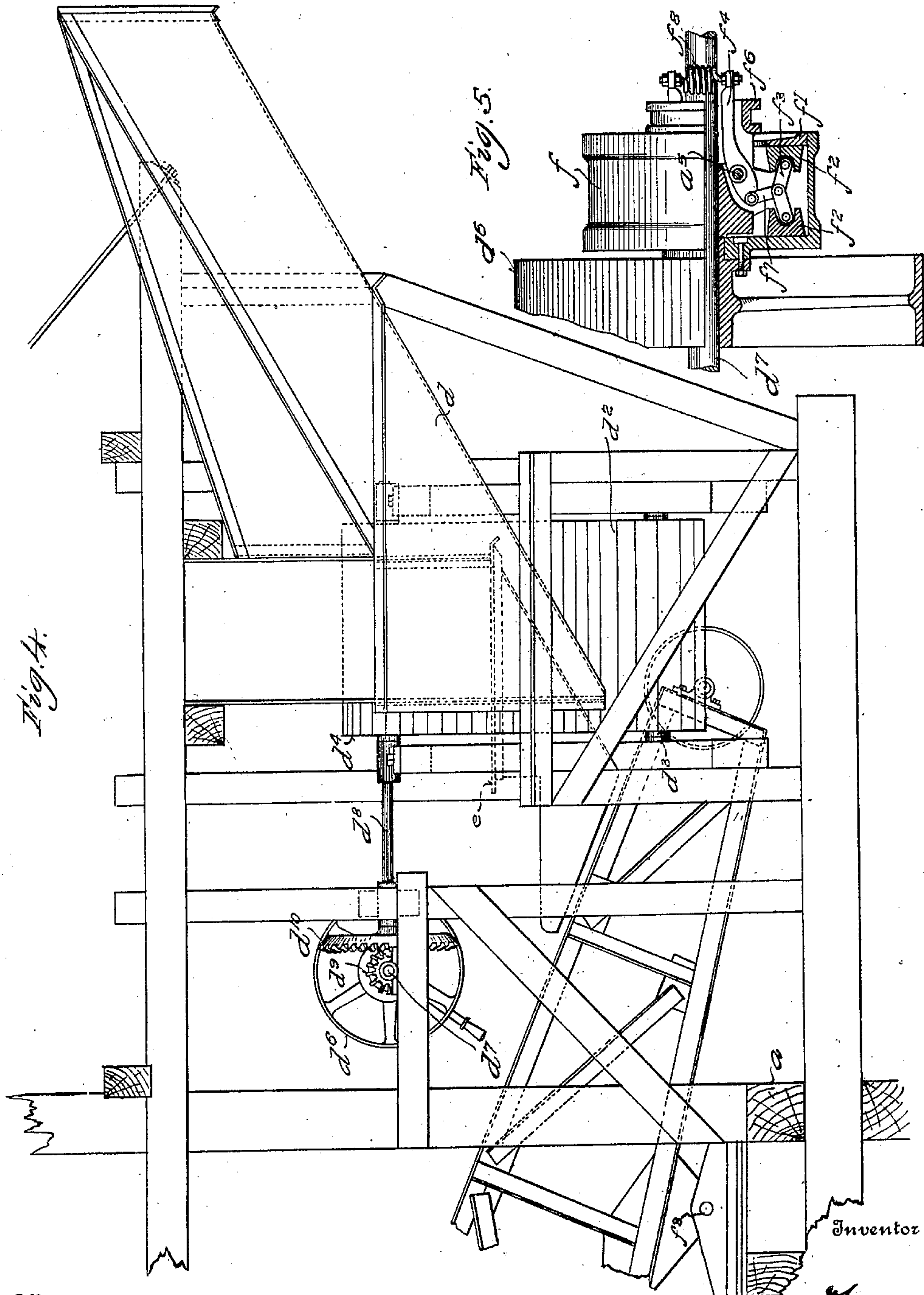
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Witnesses

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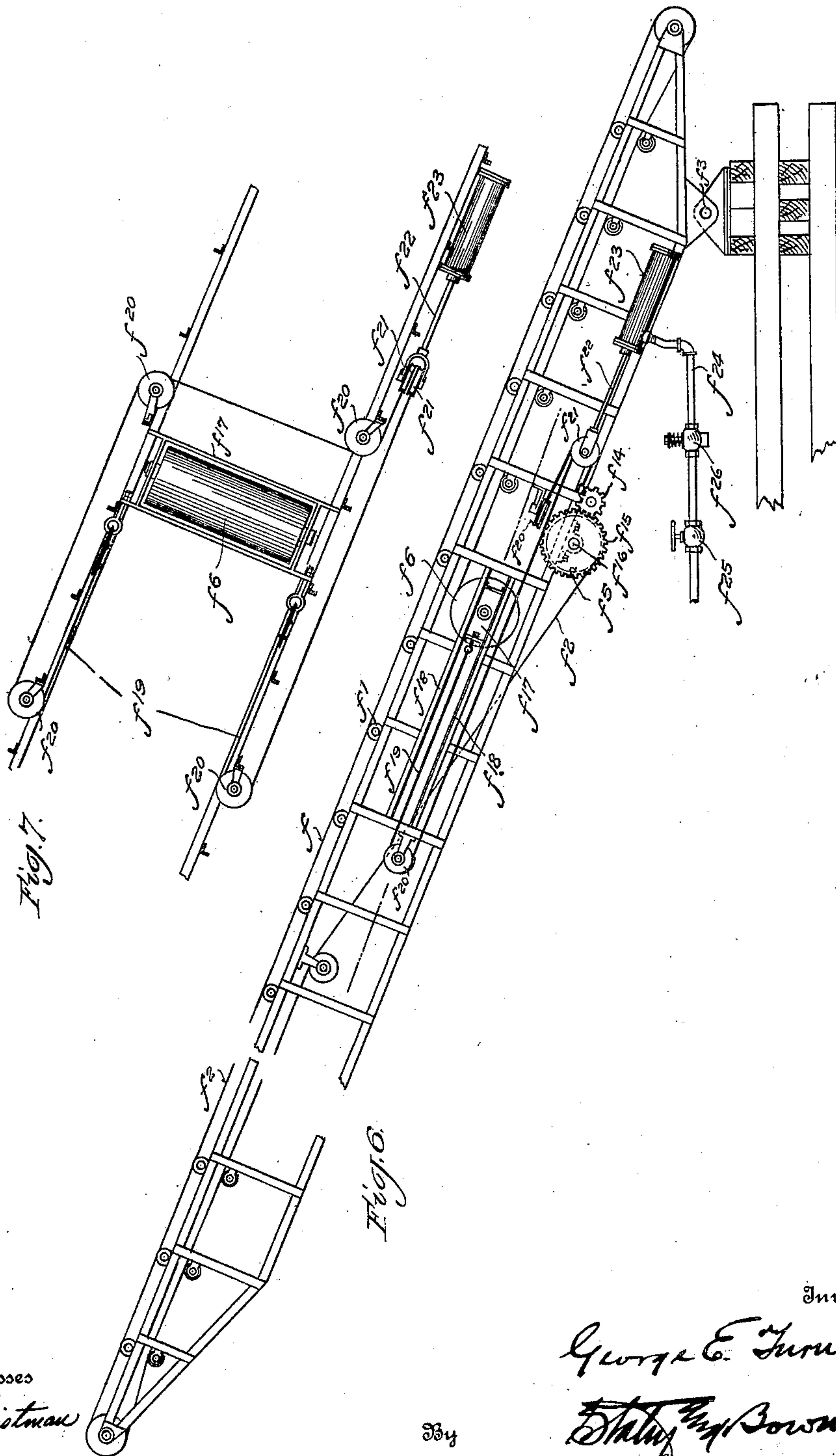
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11 SHEETS—SHEET 5.



Witnesses
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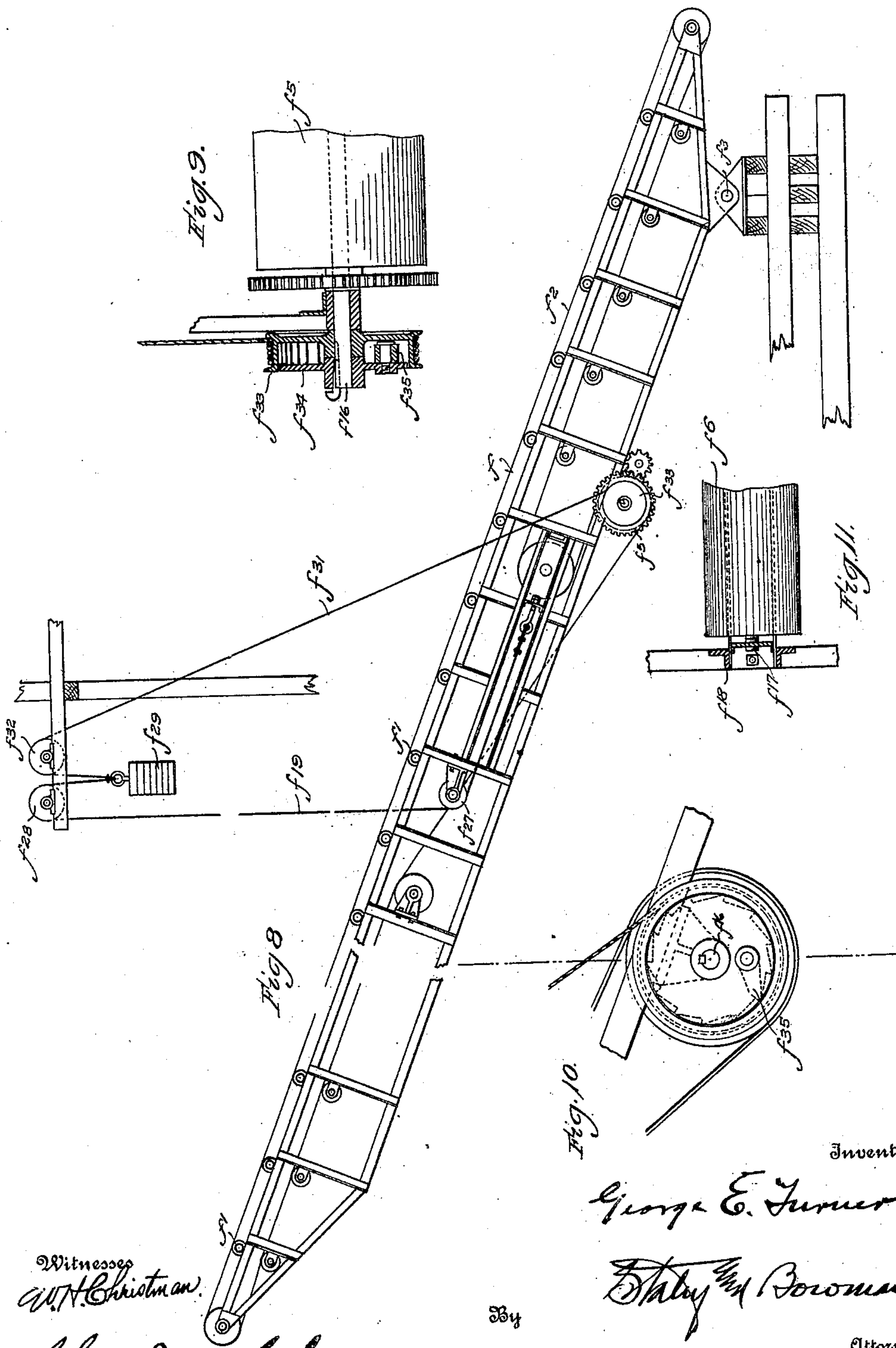
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Witnesses
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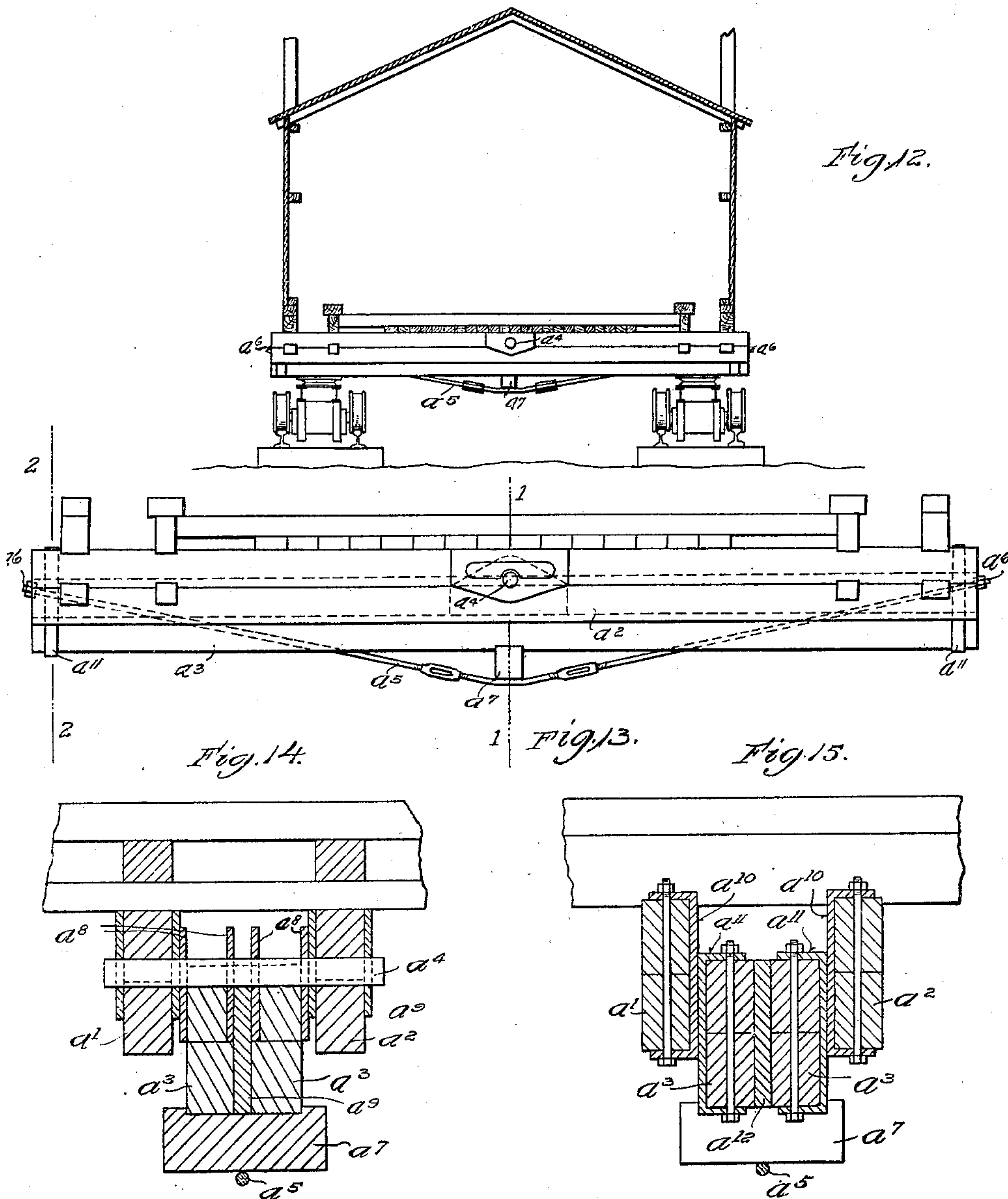
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11 SHEETS—SHEET 7.



Witnesses
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APPLICATION FILED MAR. 25, 1908.

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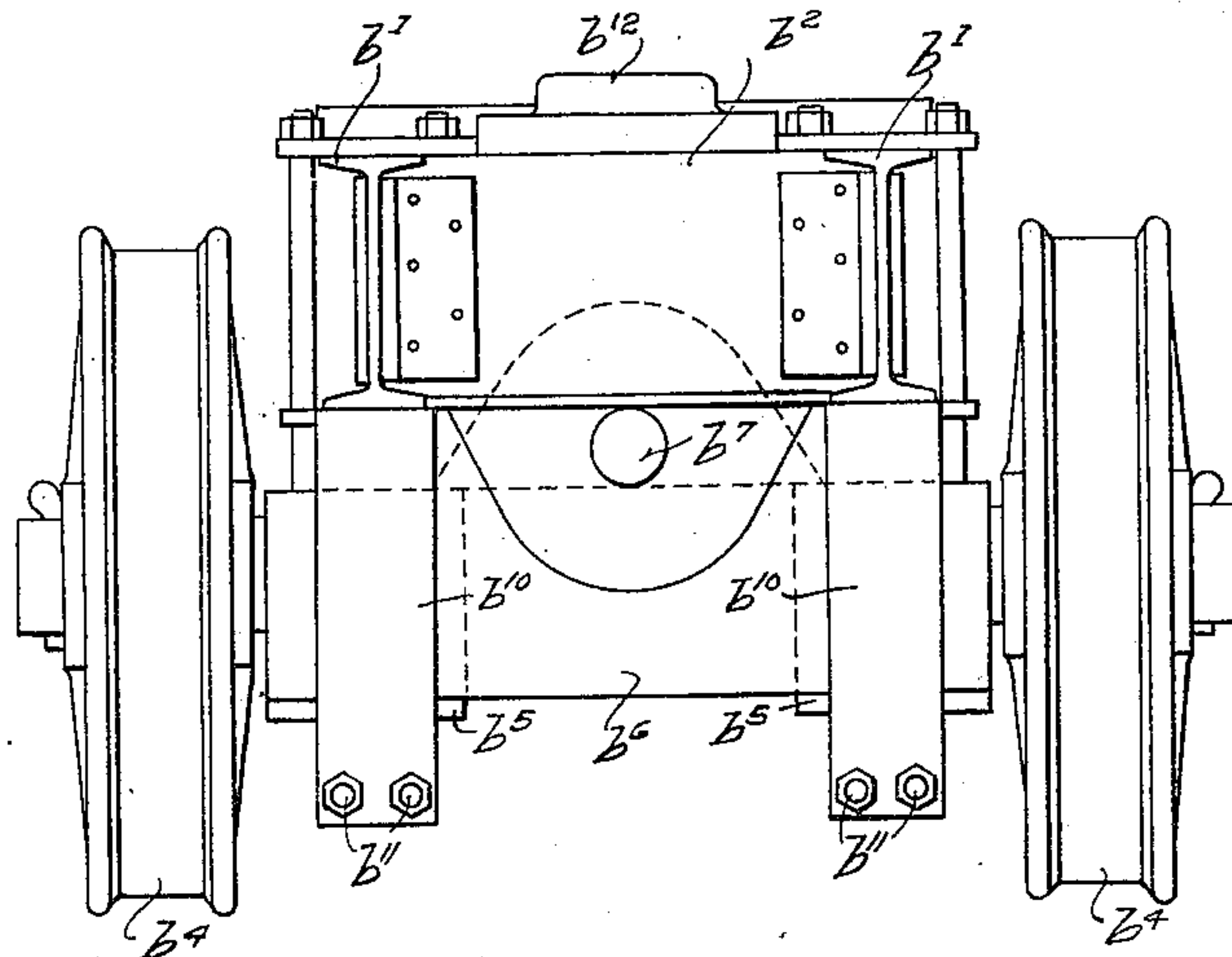


Fig. 17.

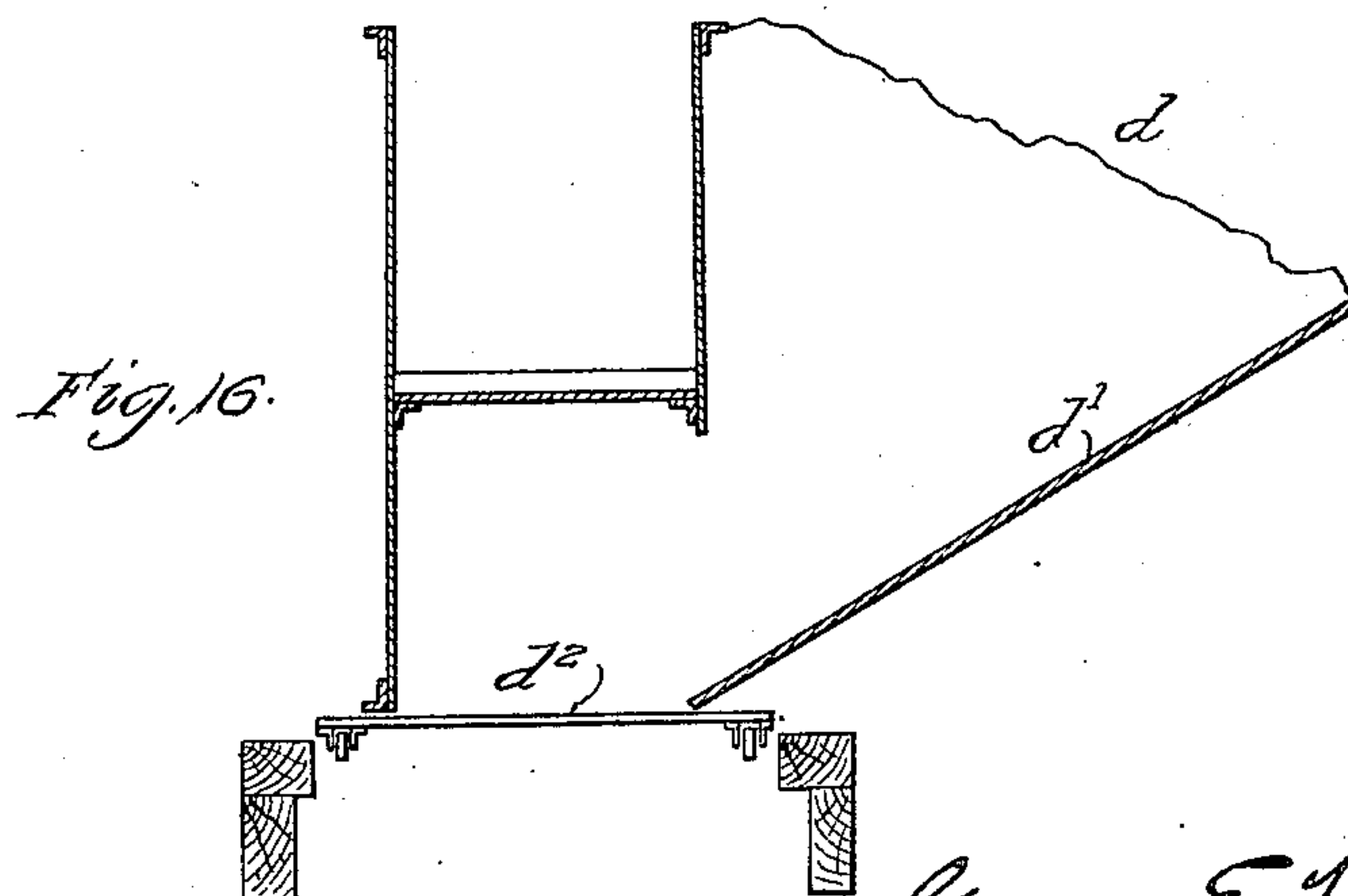


Fig. 16.

Witnesses

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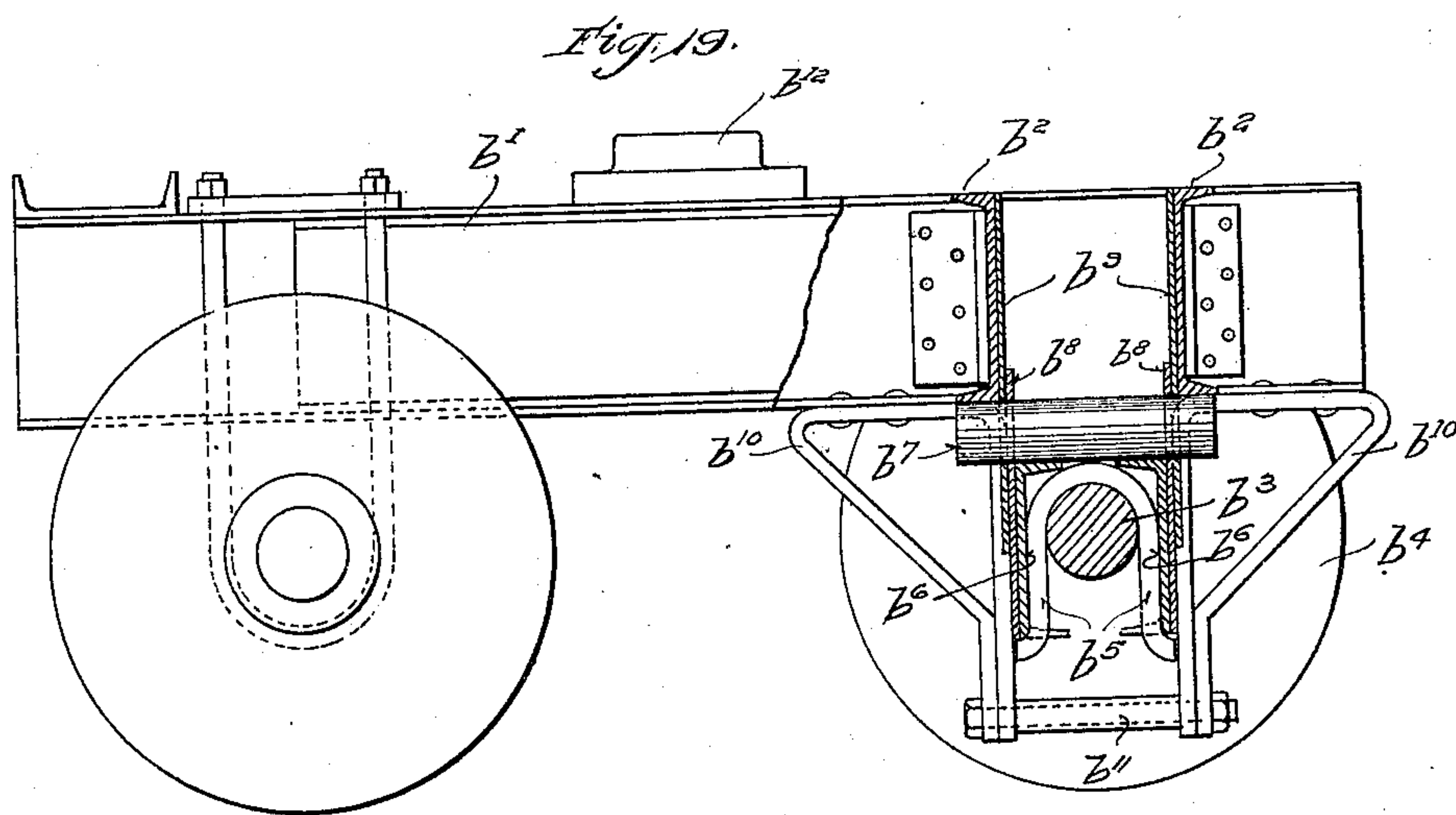
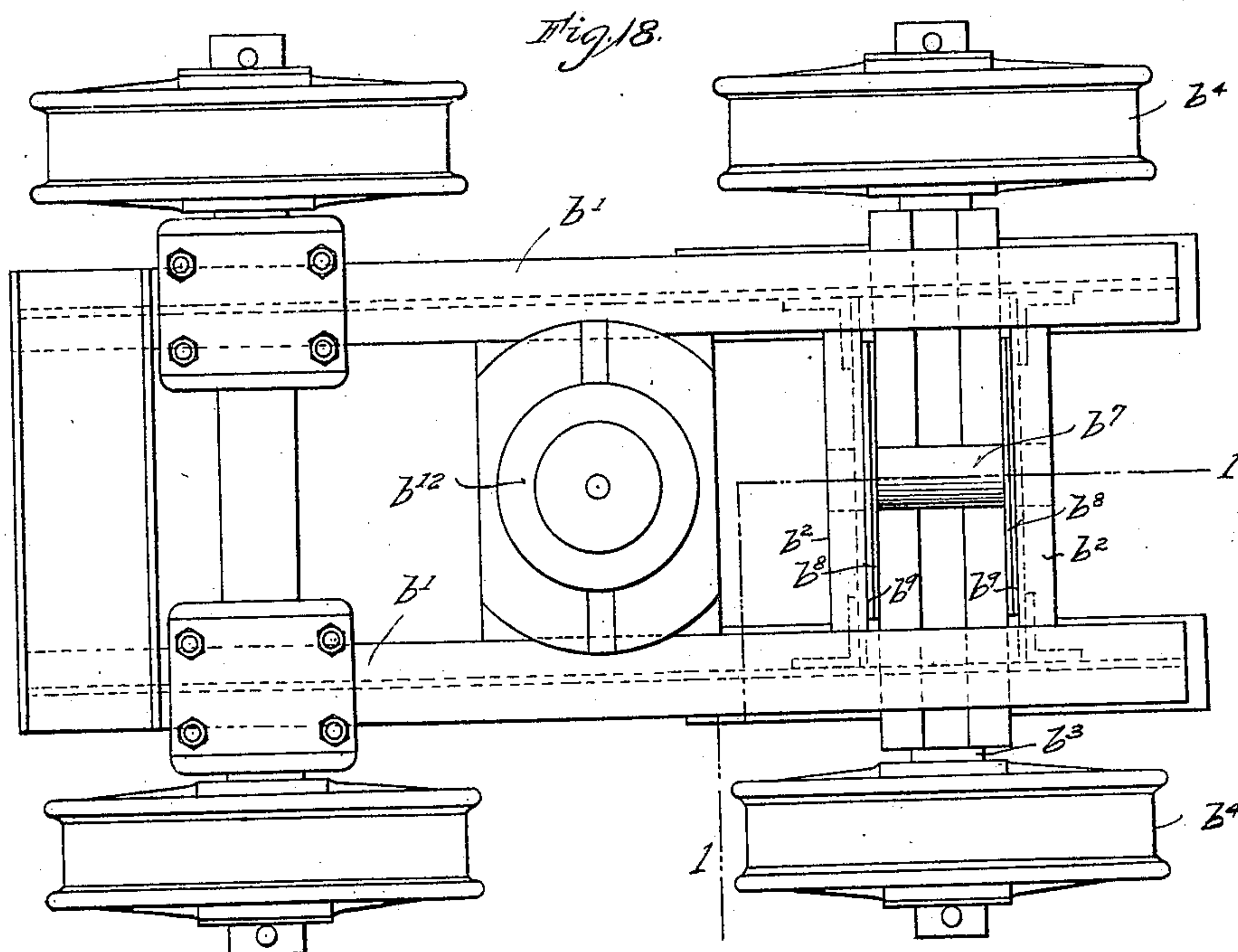
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Patented May 18, 1909.
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Witnesses
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APPLICATION FILED MAR. 25, 1908.

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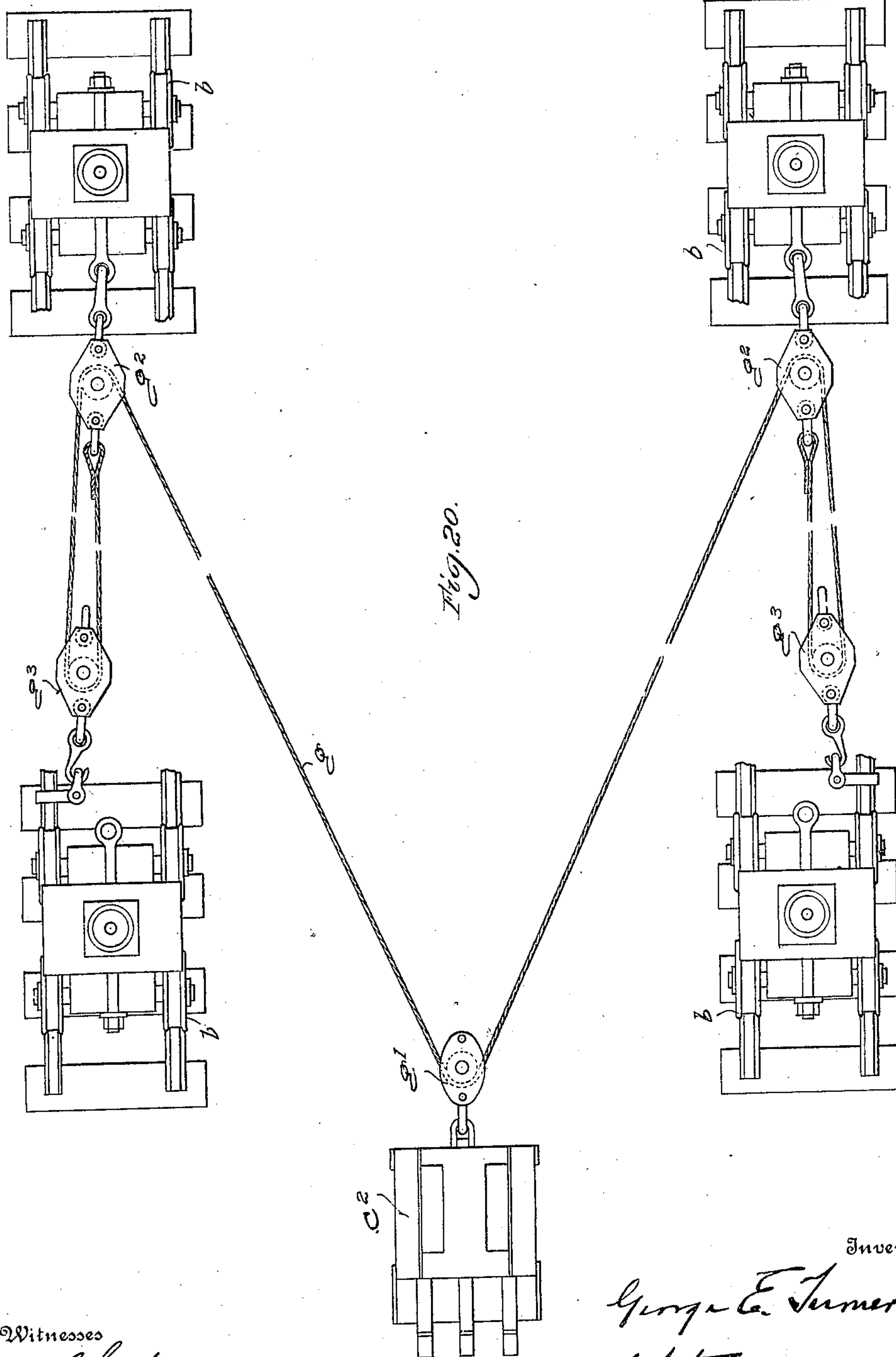


Fig. 20.

Witnesses

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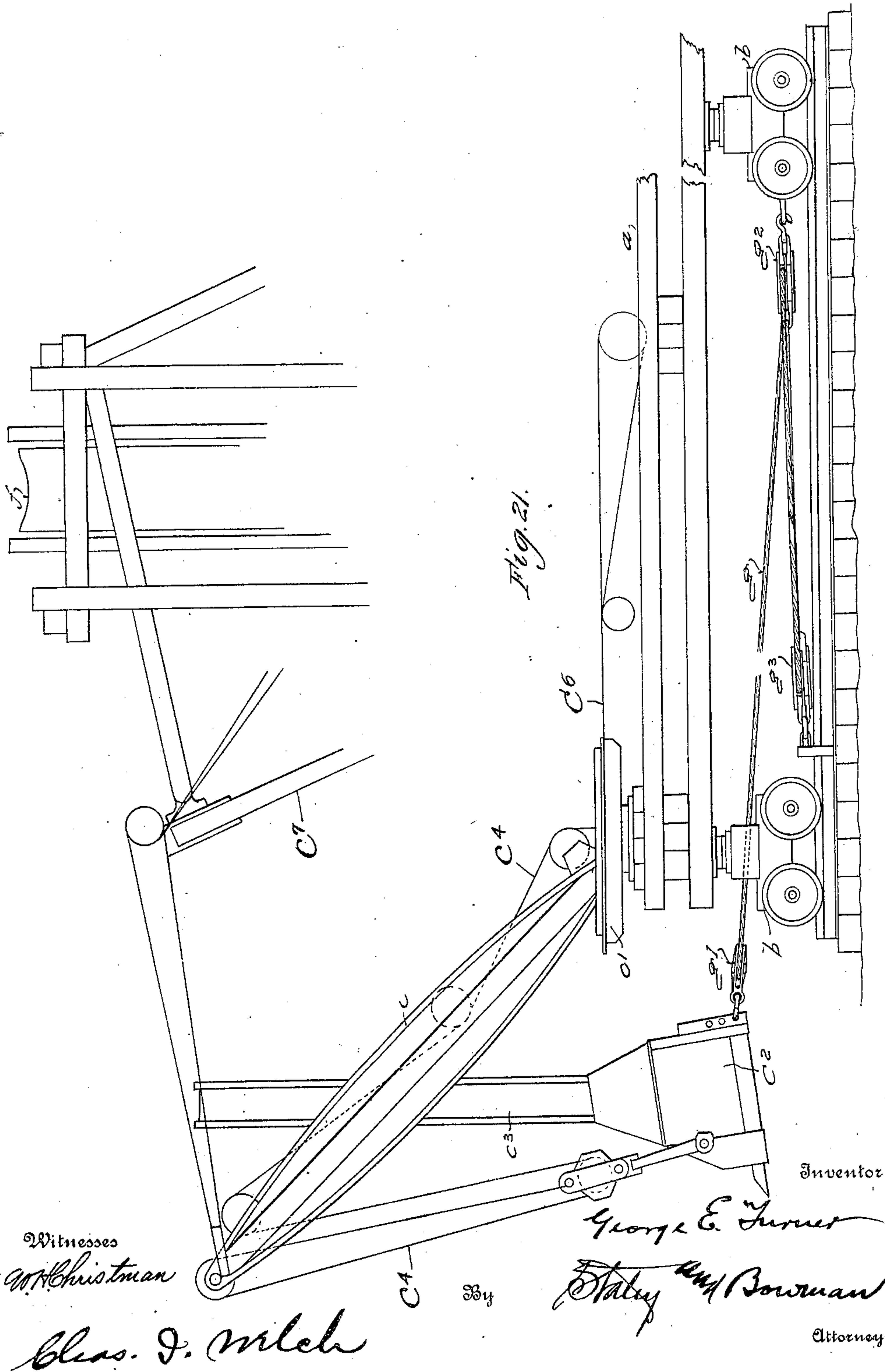
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APPLICATION FILED MAR. 25, 1908.

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11 SHEETS—SHEET 11.



UNITED STATES PATENT OFFICE.

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STEAM-SHOVEL.

No. 922,213.

Specification of Letters Patent.

Patented May 18, 1909.

Application filed March 25, 1908. Serial No. 423,213.

To all whom it may concern:

Be it known that I, GEORGE E. TURNER, a citizen of the United States, residing at Bellefontaine, in the county of Logan and State of Ohio, have invented certain new and useful Improvements in Steam-Shovels, of which the following is a specification.

This invention relates to improvements in steam shovels.

10 The object of the invention is to provide a machine of large capacity for stripping the earth from coal veins rock, ore, etc., the particular object being to provide a machine of this character which will not only remove
15 the earth but which will also convey the earth to a suitable dumping point which will be sufficiently removed from the bank side as to be out of the way of the operation of removing the coal, rock or ore after the
20 earth has been stripped; it being the intention to displace by this machine the usual train of dumping cars which are ordinarily used to convey the earth from the point of operation to a suitable dumping ground.

25 A further object of my invention is to improve the construction of a machine of this character to adapt it to the work to be performed.

30 The invention consists in the various constructions hereinafter described and set forth in the claims.

In the accompanying drawings, Figure 1 is a front elevation of a machine embodying my invention. Fig. 2 is a side elevation of
35 the same, the view being one looking toward the left of Fig. 1, it being what is known as the bank side of the machine. Fig. 3 is a side elevation of the main hopper with its movable bottom or feeder and the auxiliary
40 hopper of the main carrier, looking in the same direction as in Fig. 2. Fig. 4 is a front elevation of the same. Fig. 5 is a detail of the clutch mechanism for the driving pulley of the movable bottom or feeder of the main
45 hopper. Fig. 6 is a side view of the main carrier looking from the front of the machine, showing the mechanism for driving the belt and tightening and loosening the tension thereon. Fig. 7 is a top plan view
50 of the tensioning mechanism for the main carrier belt. Fig. 8 is also a side elevation of the main carrier showing a modified form of tensioning mechanism for the belt. Figs. 9, 10 and 11 are details of some of the parts
55 of the driving and tensioning mechanism for

the main carrier belt. Fig. 12 is a rear end view of the device, and Fig. 13 is an enlarged similar view of a portion of the same. Fig. 14 is a section on the line 1—1 and Fig. 15 is a section on the line 2—2 of Fig. 13. Fig. 60 16 is a sectional view of the main hopper the section being on the line 6—6 of the Fig. 3. Fig. 17 is a front elevation of one of the supporting trucks. Fig. 18 is a top plan view of the same. Fig. 19 is a section on
65 the line 1—1 of Fig. 18: Figs. 20 and 21 are two views illustrating the system for moving the machine forward by the dipper, Fig. 20 being a top plan view, and Fig. 21 a side elevation.

70 Like parts are represented by similar characters of reference in the accompanying drawings.

As illustrated in the drawings only such parts of the operating mechanism has been
75 shown which performs the operation of digging and shoveling as has been deemed necessary, all of this mechanism such as the boom swinging device, and the devices for hoisting and backing the dipper being
80 the usual well known mechanism employed in this class of machines. This mechanism is mounted upon a main frame *a a a* in the usual way, said frame being supported by
85 four trucks, *b*.

c represents the boom mounted upon the usual turn-table, *c*¹, operated by the chain or cable, *c*², from the ordinary power winding drums; the outer end of the boom being supported from the usual A-frame, *c*³. This
90 turn-table carries the excavating device, *c*⁴, which, in the present case, is shown as of the dipper type of excavator; this dipper being operated by the usual devices such as the hoisting and backing cable, *c*⁵, operated
95 from the usual power drums (not shown) and having the usual means for operating its handle through the boom, such as the crowding engine, *c*⁶.

100 Located on the bank side of the machine, at the forward part of the frame, *a*, is a hopper *d* into which the dipper is adapted to dump. This hopper is provided with an incline side (shown best in Fig. 16) and has
105 located in the bottom thereof an incline feeder or carrier *d*², the direction of travel of which is toward the rear of the machine, so as to deposit the earth into a small auxiliary hopper, *e*, located above the lower end
110 of a long inclined conveyer *f*. The feeder

or carrier d^2 may be of any well known type of conveyer passing over sprockets d^3 d^4 at its respective ends and having any suitable tightening means as shown at d^5 for instance. The carrier is driven through the medium of a pulley d^6 connected to any suitable source of power, this pulley being mounted upon the shaft d^7 in such a way as to permit it to slip whenever an undue load is deposited upon the feeder as will be described farther on. The shaft d^7 is connected to the shaft d^8 which carries the sprockets d^4 through the medium of the beveled pinion d^9 , and a beveled gear d^{10} connected to the respective shafts.

As before stated the pulley d^6 is connected to the shaft d^7 by a friction clutch in such a way that the pulley can be not only thrown into and out of engagement with said shaft at the will of the operator but will also be allowed to slip on the shaft whenever an undue load such as a large boulder or anything which would be liable to injure the carriers, is deposited in the hopper. In Fig. 5 I have illustrated a well known form of such a clutch. f represents the outer casing secured at one end to the pulley d^6 and having a removable cap f^1 at the other end. f^2 represents friction shoes or plates adapted to be thrown into and out of frictional engagement with the casing and its cap through the medium of the toggles f^3 , and lever, f^4 , pivoted at f^5 to the cone f^6 and connected to the toggles by the link f^7 ; the outer ends of the levers, (one lever only being shown) being connected with a spring f^8 . By moving the cone in and out through any suitable means the plates or shoes will be engaged or disengaged and the springs help to sustain the frictional engagement between the parts. Means are provided for adjusting these springs so that the clutch can be regulated to slip when a certain power is exceeded so that any danger resulting from the deposit into the hopper of anything which would be liable to injure the carrier is thus obviated.

The main carrier, f , consists of a long arm or frame having a series of friction and guide rollers, f^1 , over which passes the endless belt, f^2 , this frame or arm being pivoted at f^3 to a suitable frame or car which can be either stationary or movable, and being adapted to be held in different positions of elevation by the cables f^4 which may be connected to any suitable source of power for the purpose of raising and lowering the arm f . The belt, f^2 , passes around a driving pulley f^5 , mounted in fixed bearings connected to the arm, and thence around an idler pulley f^6 . The driving pulley, f^5 , is driven from any suitable source of power in the machine, preferably from the engine shaft, f^7 , through the medium of the pulley,

f^8 , and belt f^{10} passing around the pulley, f^{12} , connected to the shaft f^{13} located in suitable bearings on the arm, f , and having a pinion, f^{14} , engaging with a gear, f^{15} , connected to said driving pulley or to its shaft f^{16} . The pulley, f^{12} , is preferably connected to the shaft, f^{13} , by a friction clutch to permit the pulley to slip thereon under a certain load on the carrier, this friction pulley being constructed the same as the one, d^6 , shown in Fig. 5.

The idler pulley, f^6 , is movable and has connected therewith means for automatically keeping a certain tension upon the belt f^2 . The pulley, f^6 , is mounted in a sliding frame, f^{17} , which is adapted to slide in guide-ways, f^{18} , on each side of the frame or arm f . Connected to the sliding frame f^{17} , are two cables, f^{19} , passing around a series of pulleys f^{20} , and also about two pulleys, f^{21} , which are connected to piston rod, f^{22} , of the steam cylinder f^{23} . The supply pipe f^{24} , has a shut-off valve, f^{25} , and also a pressure reducing valve, f^{26} , by means of which any desired and constant pressure may be maintained irrespective of any pressure of the steam supply.

In the operation of the device the reducing valve is set to maintain the least pressure in the cylinder that will hold the belt tight enough to prevent slipping on the driving pulley, after which the opening and closing of the shut-off valve puts on or takes off the tension on the belt, so that the proper tension on the belt is automatically maintained irrespective of any stretching or shrinkage of the belt from any cause.

In Figs. 8, 9, and 10 I have shown a modification in the devices for securing the proper tension on the belt f^2 in which weights are employed instead of the cylinder. In this case the cables, f^{19} , pass over the pulleys, f^{27} , one on each side of the arm or frame f and thence over the pulleys, f^{28} , located on the frame work above the arm f , and are connected to the weights f^{29} . Also connected to these weights is a cable, f^{31} , which passes about the pulley, f^{32} , upon the frame work and thence to the drum, f^{33} , which is loose on the shaft, f^{16} , of the driving pulley f^5 . Keyed to the shaft, f^{16} , is a hub f^{34} , carrying a pawl, f^{35} , adapted to engage with internal teeth on the drum, f^{33} , when the shaft, f^{16} , is turned backwardly, said pawl running loosely over these teeth in the forward rotation of the shaft. When it is desired to relieve the tension on the main belt, f , the shaft, f^{16} , is backed thus running the weights, f^{29} , up and relieving the tension on the cables f^{19} , and hence on the belt. It is obvious that any ordinary clutch device may be used for the purpose of rotating the drum, f^{33} , to raise the weights, it being understood that as soon as the weights are raised a short distance the tension will be

relieved and the belt allowed to slip on the pulley.

In a machine of this kind where the operating parts are necessarily very heavy and must be all mounted upon a single frame which must be moved over very uneven ground, I have found it necessary to mount the frame on the supporting trucks in such a way that the frame will have more or less flexibility, the trucks themselves being constructed in a way to permit further flexibility in the movement of the machine over the ground in a way which will be described hereinafter. Extending across the lower part of the rear end of the frame are two transverse frame pieces, $a^1 a^2$, located a suitable distance apart. Located between these frame pieces, $a^1 a^2$, and supported at each end by the trucks is a bolster, a^3 . Extending across the respective frame pieces, $a^1 a^2$, midway in their length is a supporting pin, a^4 , which has a bearing upon the bolster, a^3 . The bolster, a^3 , is strengthened by the truss rod, a^5 , anchored at each end in the bolster as at a^6 and extending down through and beneath the bolster, a block, a^7 , being preferably interposed between the bolster and the truss rod at the center. The bolster is preferably constructed of two beams, a^8 , secured together at their centers by a series of plates, a^8 , which plates also form the bearing proper for the pin a^4 , a spacing block or plank, a^9 , being inserted at this point between the beams, a^8 , and the inner plates a^8 . At the respective ends of both the frame pieces, $a^1 a^2$, and the bolster a^3 , are provided wearing plates, a^{10} , a^{11} , which take up the wear between the parts at these points, a spacing block, a^{12} , between the respective parts of the bolster being also inserted at these points.

In order to provide for further flexibility in the movement of the frame I have constructed each of the trucks in such a manner that the truck frames will be swiveled upon one of the axles of the truck. Each of the trucks is made up of two longitudinal I-beams b^1 , connected together by transverse channel bars b^2 . The axle b^3 , is supported at each end by the carrier wheels, b^4 , which run loosely thereon. Supported on the axle are straps, b^5 , one at each end, and supported by these straps are two transverse channel bars b^6 , the lower ends of the straps being out-turned so as to provide a support for the bars as shown, said bars being cut away at the points where the straps turn under. Located at the center of the channel bars, b^6 , is a pin, b^7 , upon which rests the transverse channel bars, b^2 , of the truck frame. To maintain the parts in position I have secured to the channel bars, b^6 , plates, b^8 , and to the transverse bars, b^2 , plates, b^9 , which plates are provided with openings through which extends the pin, b^7 , these plates being adapted to hold the parts from

lateral movement. I have also secured to each of the longitudinal I-beams at each side, frame parts, b^{10} , which inclose the channel bars, b^6 , and are secured together at the bottom by a bolt or rod, b^{11} , these frame parts, b^{10} , being adapted to hold the parts against longitudinal movement in reference to each other. The truck frame proper is rigidly supported upon the other axle in any suitable manner. The forward part of the main frame of the machine and each end of the bolster, a^3 , is supported upon these respective trucks at a point in the center thereof as indicated at b^{12} , this supporting seat, b^{12} , being in the nature of a rounded socket to receive the rounded projection on the frame part or bolster so as to permit a more or less free movement of the frame on the trucks.

In Figs. 20 and 21 I have shown a system of moving the machine forward through the medium of the dipper c^2 . g represents a cable passing over the pulley in the block g^1 , which is connected to the dipper, thence about the pulleys in the blocks, g^2 , connected respectively to the rear trucks, thence about the pulleys in the blocks, g^3 , which may be anchored at any suitable point, as for instance, to the temporary track, and thence back to the pulley blocks, g^2 , to which the respective ends of the cables are connected. By dropping the dipper down to its lower-most position as shown in Fig. 21 and then raising it by the hoisting drum the machine can be readily moved forward. This mode of moving the machine is made necessary by the great weight of the machine, it having been found to be entirely impracticable to apply the power direct to the axles of the trucks or to the wheels. The same system may be employed for moving the machine rearward, by connecting two of the pulley blocks to front trucks and anchoring the other two blocks to a point in the rear; the cable g being passed about the anchor pulleys, thence about the pulleys connected to the front trucks and thence back and connected again to the anchored pulleys.

Having thus described my invention, I claim:—

1. In a machine of the character described, a main frame, an excavator and means for operating same, a hopper to receive the dumpings from said excavator, a continuously moving feeder in proximity to said hopper, and a conveyer located at the discharge end of said feeder, all of said parts being supported on said main frame, substantially as specified.

2. In a machine of the character described, a main frame, an excavator and its operating mechanism, a continuously moving feeder located in the path of movement of said excavator, a continuously moving conveyer located at the discharge end of said feeder,

and means for guiding the dumpings from said excavator onto said feeder and from thence onto said conveyer, all of said parts being supported on said main frame, substantially as specified.

3. In a machine of the character described, an excavator and its operating mechanism, a main hopper having a continuously moving feeder, a conveyer located at the discharge end of said feeder, mechanism for operating said feeder, and means for disengaging said mechanism from said feeder under a certain load on said feeder, substantially as specified.

4. In a machine of the character described, an excavator and its operating mechanism, a main hopper having a movable feeder therein, a conveyer located at the discharge end of said feeder, driving mechanism for said feeder and means for disconnecting said driving mechanism at the will of the operator and also for disengaging said mechanism from said feeder under a certain load on said feeder, substantially as and for the purpose specified.

5. In a machine of the character described, a main frame, an excavator and its operating mechanism, a main hopper located in the path of movement of said excavator, a continuously moving inclined feeder in said hopper, a continuously moving long conveyer, the lower end of which is at the discharge end of said feeder, and an auxiliary hopper between said feeder and conveyer, all of said parts being supported by said main frame, substantially as specified.

6. In a machine of the character described, a main frame, an excavator and its operating mechanism, a hopper located in the path of movement of said excavator, a continuously rearwardly moving feeder in said hopper, a continuously moving conveyer located at the discharge end of said feeder, said conveyer extending at right angles to said feeder, all of said parts being supported on said main frame, substantially as specified.

7. In a machine of the character described, a main frame, an excavator and its operating mechanism supported on said frame, a main hopper supported on said frame on the bank side thereof and in the path of movement of said excavator, a continuously rearwardly moving feeder in said hopper, and a continuously moving conveyer located on said frame and extending laterally therefrom in a direction away from the bank side thereof, the lower end of said conveyer being under the discharge end of said feeder, substantially as specified.

8. In a machine of the character described, an excavator and its operating mechanism, a conveyer adapted to receive the dumpings from said excavator, said conveyer comprising a continuously moving belt, means for driving said belt, and means for automatic-

ally applying and maintaining a certain tension on said belt, substantially as and for the purpose specified.

9. In a machine of the character described, an excavator and its operating mechanism, a conveyer adapted to receive the dumpings from said excavator, said conveyer comprising a continuously moving belt, means for driving said belt, a pulley about which said belt passes, said pulley being located in a frame having guide ways, and power operated means for moving said pulley in said guide ways a suitable distance and maintaining it in position to put and keep a uniform tension on said belt, and means for removing said tension, substantially as and for the purpose specified.

10. In a machine of the character described, an excavator and its operating mechanism, a conveyer to receive and convey the dumpings from said excavator, said conveyer comprising an endless belt, devices for driving said belt with means for disconnecting same under a certain load on said belt, means for maintaining a uniform tension on said belt, and means for releasing said tension, substantially as specified.

11. In a machine of the character described, an excavator and its operating mechanism, a conveyer comprising an endless belt, power operating devices for applying a uniform tension to said belt, and means for releasing said devices to remove said tension, substantially as and for the purpose specified.

12. In a machine of the character described, a main frame, an excavator and its operating mechanism mounted on said main frame, carrying trucks for said frame, and connections from said excavator operating mechanism to said trucks for moving said frame, substantially as specified.

13. In a machine of the character described, a main frame, an excavator and its operating mechanism mounted on said frame, a carrying truck located at each corner of said frame, pulleys connected to two of said trucks, anchored pulleys, a pulley connected to said excavator operating mechanism, and a cable passing about the respective pulleys, substantially as specified.

14. In a machine of the character described, a main frame, an excavator and means for operating the same, a hopper to receive the dumpings from said excavator, a conveyer, and means for gradually discharging the contents of said hopper onto said conveyer, all of said parts being supported on said main frame, substantially as specified.

15. In a machine of the character described, a main frame, an excavator and its operating mechanism supported on said main frame, a main hopper to receive the dumpings from said excavator, a continuously

moving long conveyer extending away from said main frame and supported thereby, the lower end of said conveyer being located in proximity to said hopper, and means for gradually discharging the contents of said hopper onto said conveyer, substantially as specified.

16. In a machine of the character described, a main frame, an excavator and its operating mechanism supported on said main frame, a long conveyer and its operating mechanism also supported on said main frame, a main hopper on said frame, an

auxiliary hopper above the lower end of said conveyer located in proximity to said main hopper, and means for gradually discharging the contents of said main hopper into said auxiliary hopper, substantially as specified.

In testimony whereof, I have hereunto set my hand this 26th day of October, 1907.

GEORGE E. TURNER.

Witnesses:

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CHAS. I. WELCH.