W. F. BROTHERS.

CABLEWAY.

APPLICATION FILED NOV. 23, 1906.

1,000,772.

Patented Aug. 15, 1911.

7 SHEETS—SHEET 1.

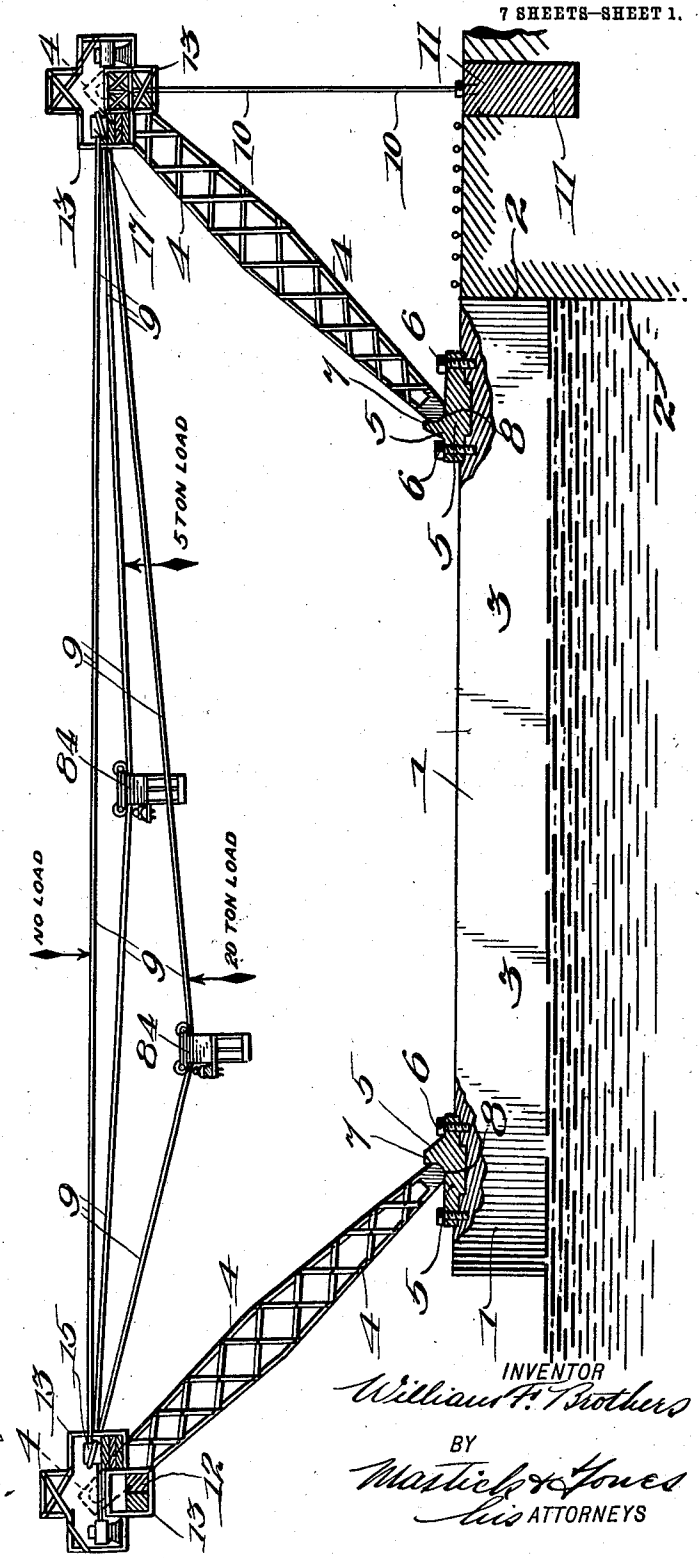

Fig. 1.

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R. W. Ashley.

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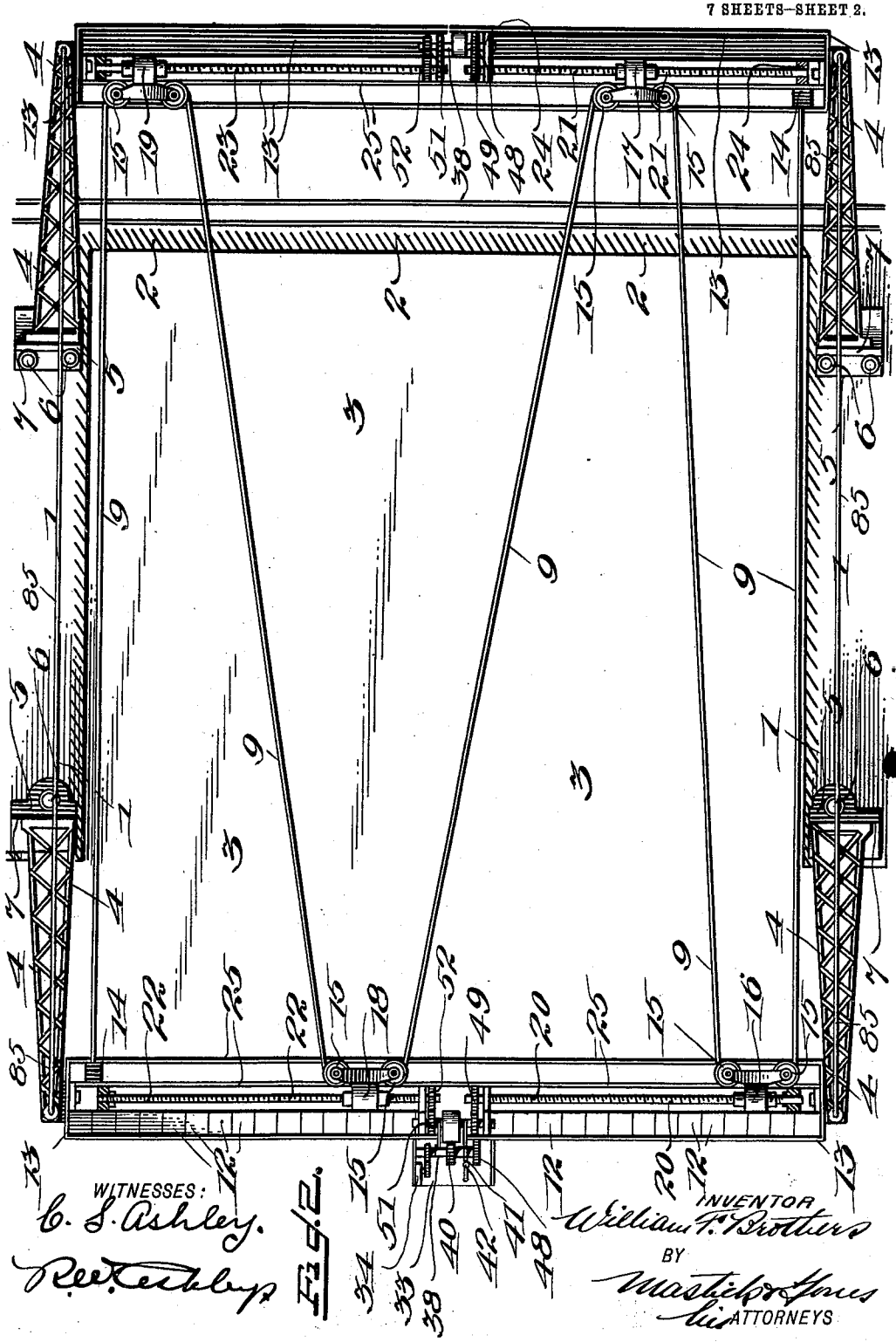
7 SHEETS—SHEET 2.



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7 SHEETS—SHEET 3.

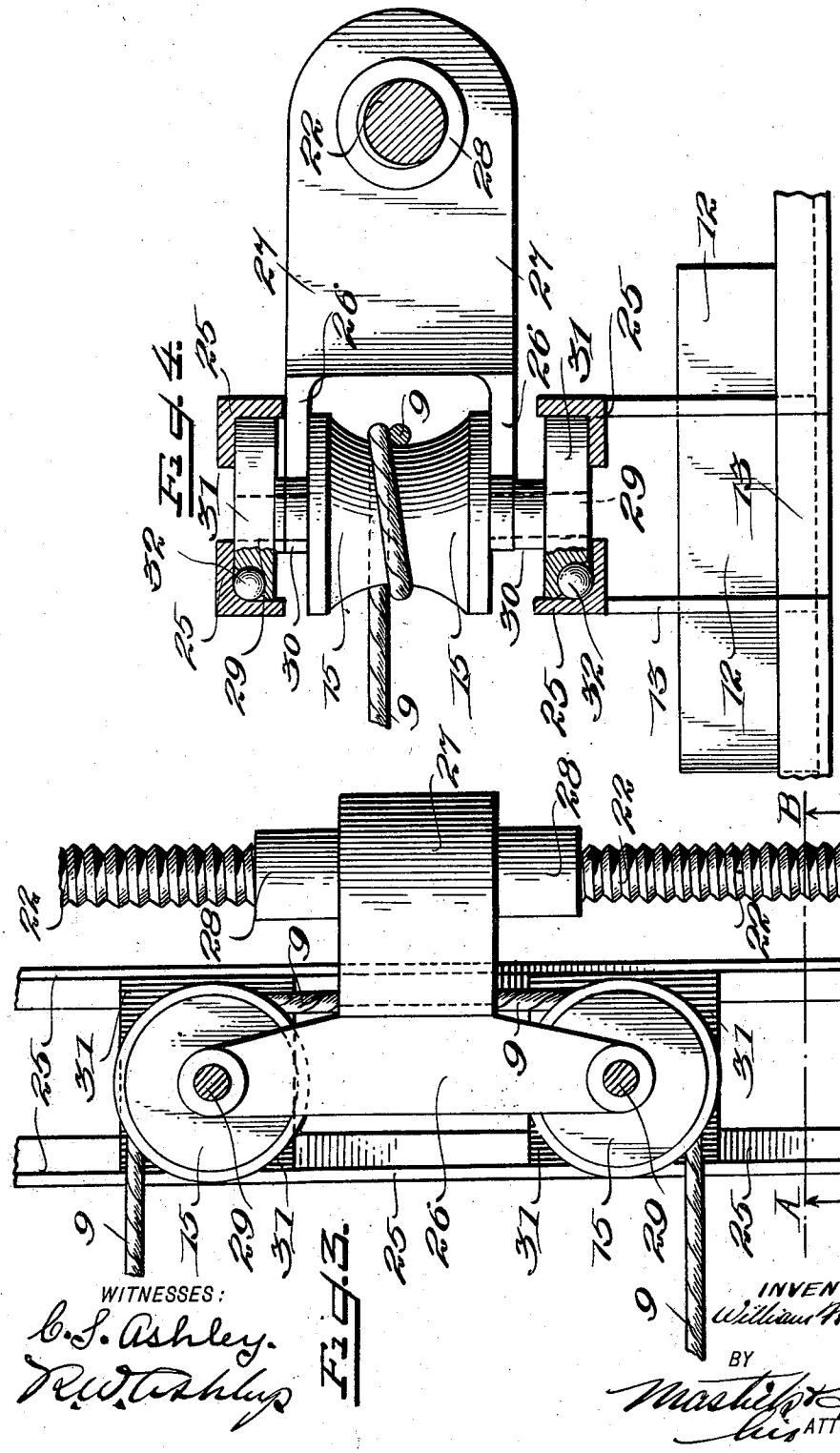

Fig. 4.

Fig. 3.

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7 SHEETS—SHEET 4.

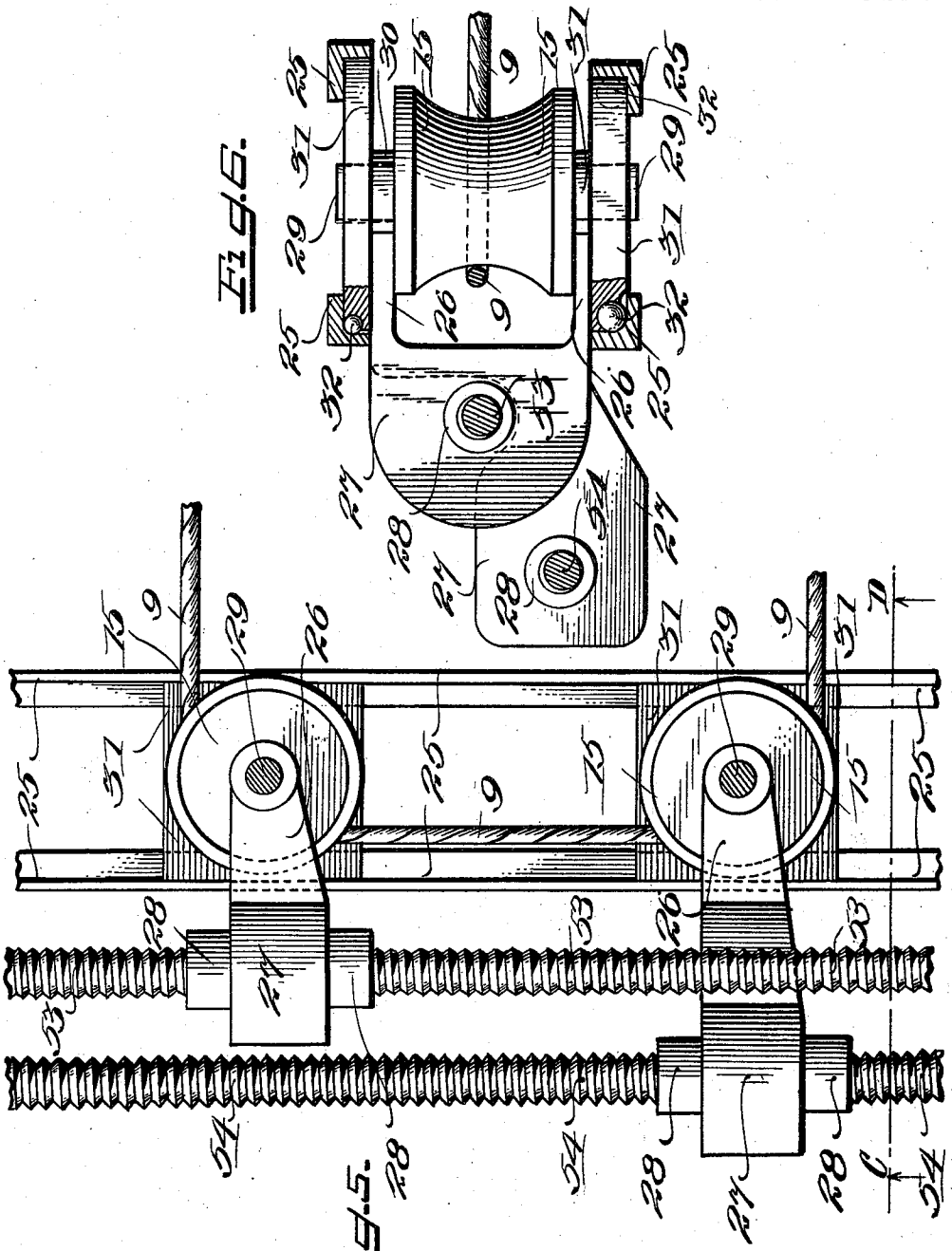

Fig. 6.

Fig. 5.

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1,000,772. **Patented Aug. 15, 1911.**

7 SHEETS—SHEET 5.

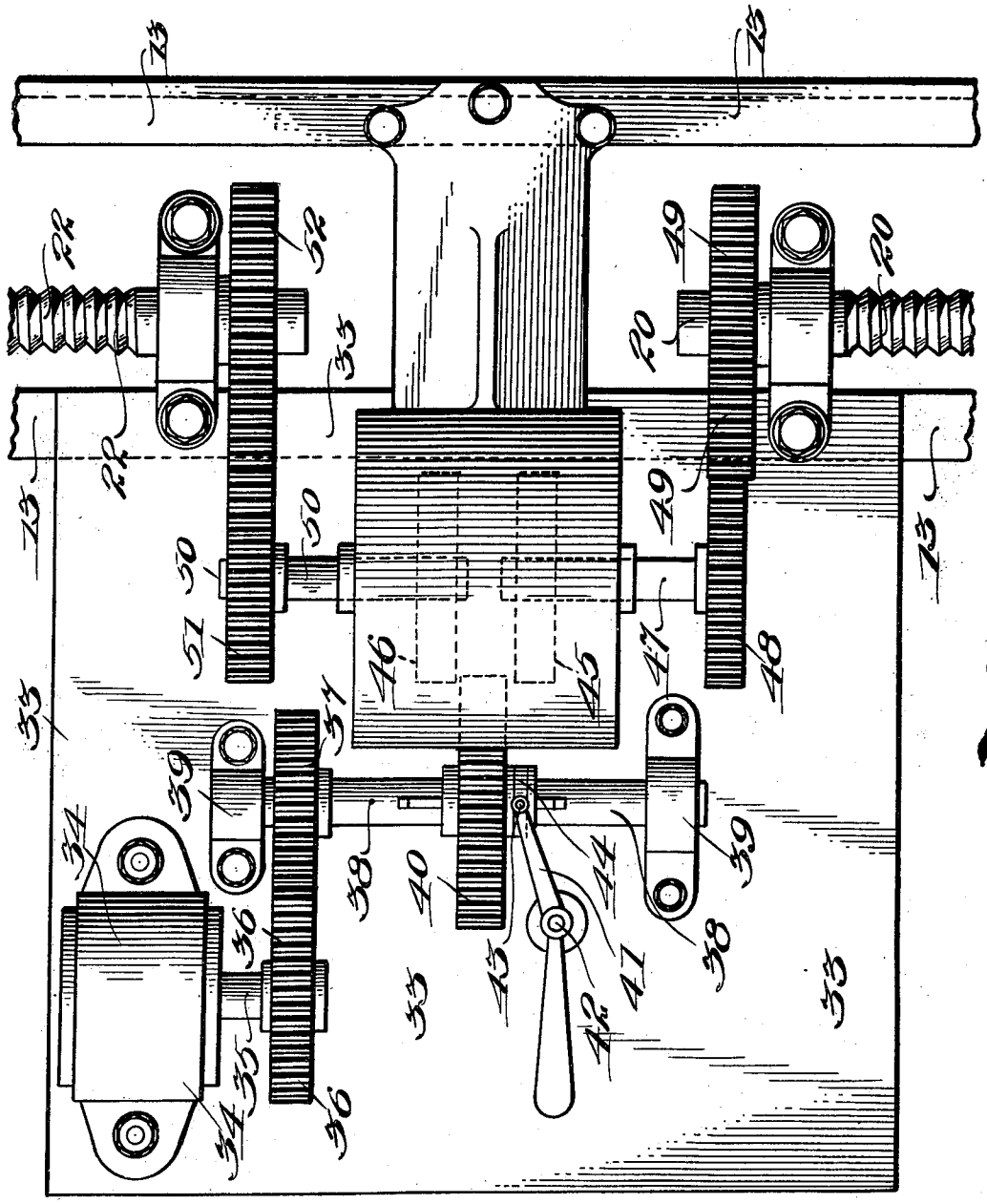

Fig. 7.

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APPLICATION FILED NOV. 23, 1906.

1,000,772.

Patented Aug. 15, 1911.

7 SHEETS—SHEET 6.

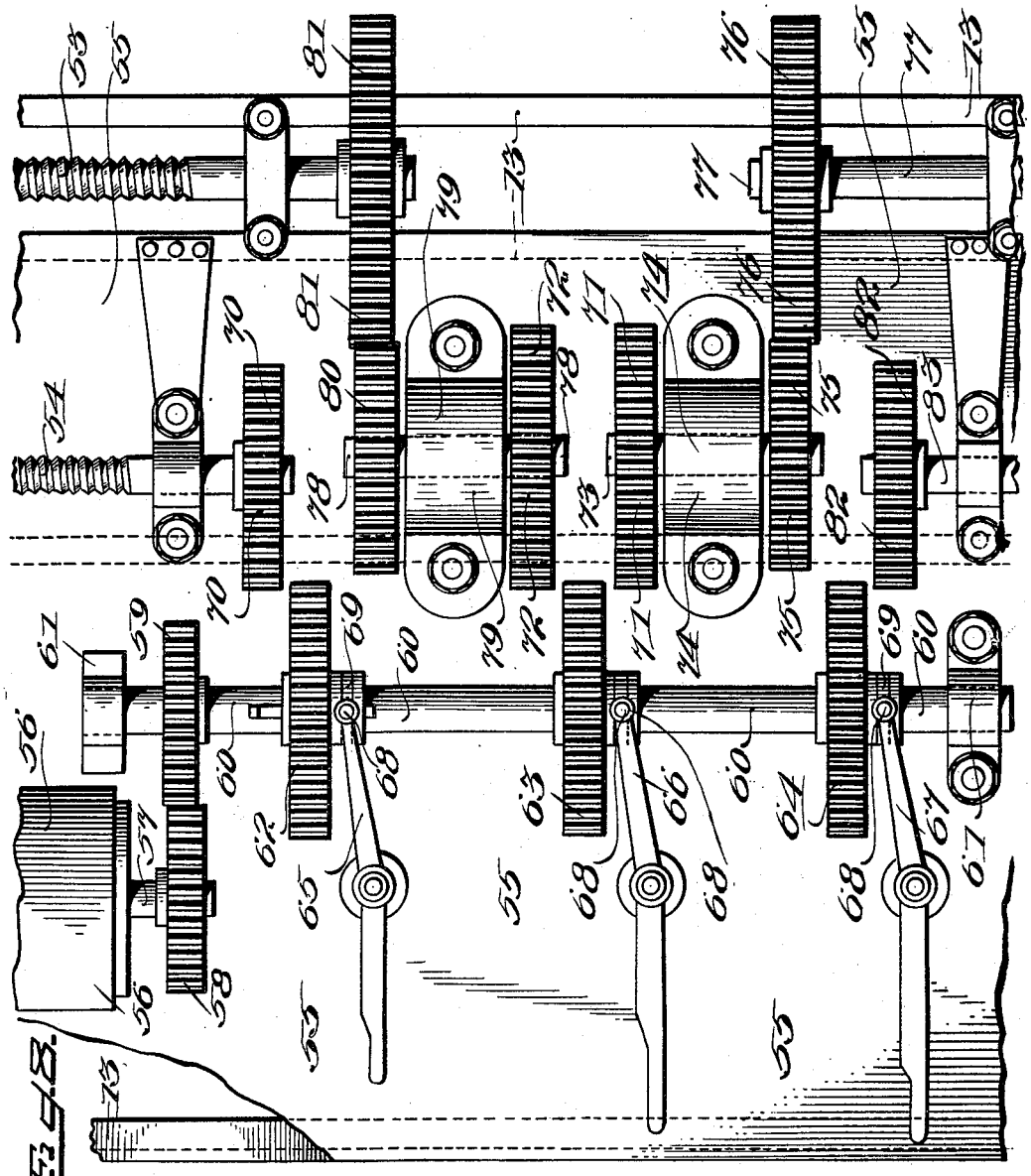

Fig. 6.

Witnesses

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CABLEWAY.

APPLICATION FILED NOV. 23, 1906.

1,000,772.

Patented Aug. 15, 1911.

7 SHEETS—SHEET 7.

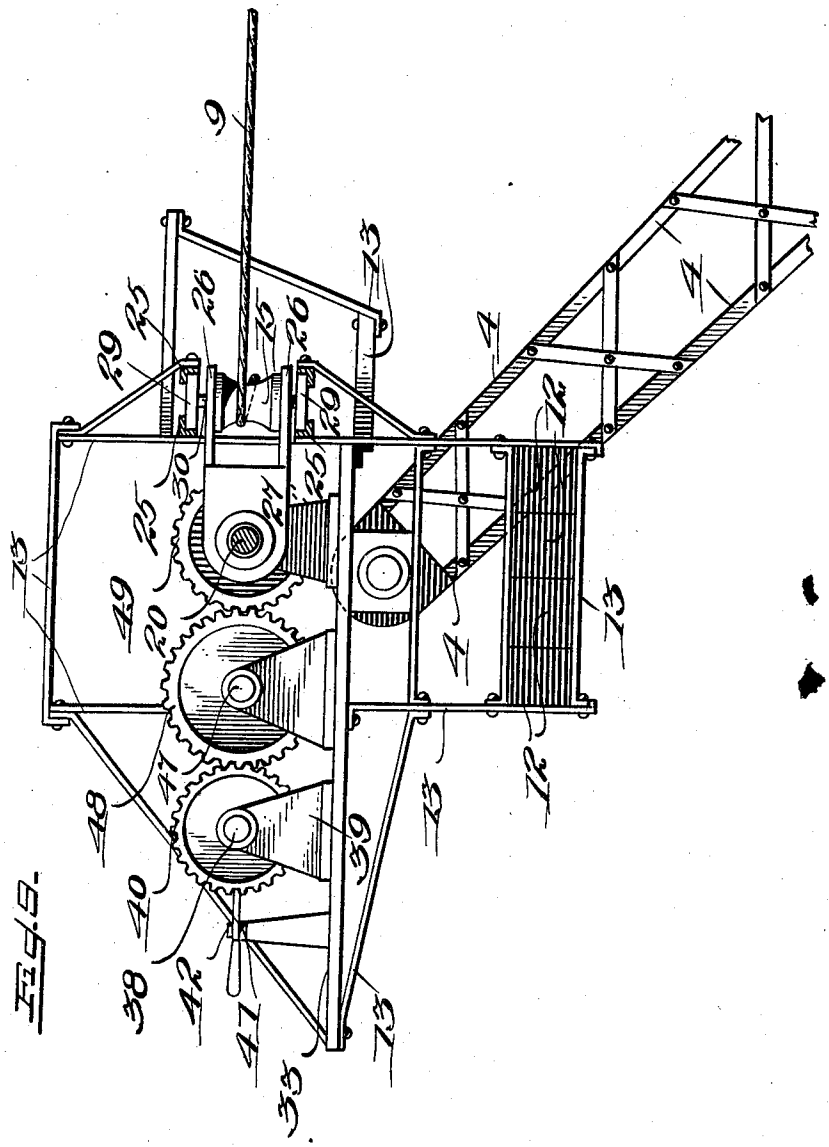

Fig. 5.

Witnesses
R. O. Ashley
C. S. Ashley

Inventor
William F. Brothers
By his Attorneys
Mastick & Jones

UNITED STATES PATENT OFFICE.

WILLIAM F. BROTHERS, OF NEW YORK, N. Y.

CABLEWAY.

1,000,772. Specification of Letters Patent. **Patented Aug. 15, 1911.**

Application filed November 23, 1906. Serial No. 344,731.

To all whom it may concern:

Be it known that I, WILLIAM F. BROTHERS, a citizen of the United States, residing in the borough of Brooklyn, New York city, in the county of Kings and State of New York, have invented certain new and useful Improvements in Cableways, of which the following is a specification.

My invention relates to improvements in cable cranes or cableways with particular reference to that type adaptable for aerial conveying such as is used in connection with apparatus for lifting, moving and depositing materials in excavating, mining, building bridges or carrying heavy weights from one place to another within a predetermined area.

In the following is described in connection with the accompanying drawings one embodiment of my invention the features thereof being more particularly pointed out hereinafter in the claims.

In the drawings Figure 1 is a longitudinal sectional view of one form of the invention as used in a dry dock, parts being removed and parts broken away to more clearly illustrate the construction and operation. Fig. 2 is a plan view thereof, parts being removed. Fig. 3 is a detail plan view partly in section of the double cableway shifting device. Fig. 4 is a cross-sectional view on the line A—B of Fig. 3. Fig. 5 is a detail plan view partly in section of the single cableway shifting device. Fig. 6 is a cross-sectional view on the line C—D of Fig. 5. Fig. 7 is a plan view of the mechanism for operating the double cableway shifting device shown in Fig. 3. Fig. 8 is a plan view of the mechanism for operating the single cableway shifting device shown in Fig. 5, and Fig. 9 is a cross-sectional view on an enlarged scale of the upper portion of one of the shear legs and its supported apparatus.

Similar numerals of reference indicate similar parts throughout the several views.

1, 1, indicate the side walls and 2 indicates the rear wall of a dry dock 3 of any suitable size as desired. Shear legs 4, 4, are adapted to be movably supported upon the walls 1, 1, as on base plates or blocks 5, 5, countersunk in said walls and fastened thereto by any suitable means such as bolts 6. The base plates or blocks 5 as illustrated have formed thereon a lug or rib portion 7 forming a socket or reception groove 8 for the base of shear legs 4, 4. The tops of the respective shear legs are connected together by a cable 9 as hereinafter described, the shear legs as illustrated being set preferably at an angle of approximately 45 degrees in order to permit the cableway to cover as much space as possible and to assist the counter-weight, hereinafter referred to, in creating the proper tension on the cable. This arrangement permits the cableway structure to reach out at both ends and be operable for the entire length of the cable. It is obvious that by the construction described the shear legs 4, 4, may rock in the socket or groove 8 on the base blocks 5. It is preferable to hold one of the pairs of shear legs against rocking by any convenient means such as by a rod or rods 10 fastened at their upper ends to the top of the shear legs and at their lower ends to a suitable anchor or stay block 11. The shear legs free to rock are preferably provided with a weight 12 suitably supported to assist the weight of the movable shear legs and parts in connection therewith in counterbalancing the weight of the cable suspended between the two sets of shear legs, the loads thereon and the weight of the fixed shear legs. The weight of the shear legs and connected parts may, however, serve wholly as putting the necessary tension on the cables, but I have found it preferable to add an additional weight such as 12 for regulating such tension.

The upper ends of the shear legs 4 may be connected together in any desirable manner as by girders or transverse bridges 13. It is preferable to pivotally mount the girders 13 in the upper ends of shear legs 4 so that the girders will always be on a plane parallel with the base line of the cableway at whatever angle the shear legs may stand. One end of the cable 9 is fastened to the upper end of each of the pairs of shear legs as by means of a block or dead eye 14 suitably supported on girders 13 and passes around sheaves 15 on shifting carriages 16, 17, 18 and 19 respectively, the cableway being continuous from one block or dead eye to the other around said sheaves thus affording in the apparatus illustrated five spans of cable stretching from one set of shear legs to the other over the dry dock. The shifting carriages are mounted on screw shafts 20, 21, 22 and 23 respectively, journaled in bearings 24 on the beams 13

and run in guide-ways or tracks 25 also supported on the girders 13. Each of the shifting carriages comprises a casting having bracket members 26, 26, and a lug member 27 carrying a collar 28 internally screw-threaded to ride upon one of the screw shafts 20, 21, 22 and 23. The sheave 15 is mounted on a shaft 29 journaled in the brackets 26 and projecting through collars 30 into guide plates 31, 31, held in guide ways 25 and provided with a suitable ball bearing 32.

The shifting control mechanism as adapted for use in connection with the apparatus heretofore described is supported on a platform 33 depending from the girders 13 and comprises a suitable motor 34 having a shaft 35 on which is a pinion 36 gearing with a pinion 37 in a shaft 38 supported in bearings 39 on platform 33. Gear 40 is splined on shaft 38 and is adapted to be shifted on said shaft by means of a lever 41 suitably pivoted at 42 and connected with a lug 43 on slip collar 44. The gear 40 according as it is shifted to the right or to the left meshes with either gear 45 or 46. Gear 45 is on a shaft 47 supported in suitable bearings (not shown) and carries at its outer end a gear 48 meshing with a gear 49 on screw shaft 20 for instance. Gear 46 is on a shaft 50 supported in suitable bearings (not shown) carrying a gear 51 in its outer end, gear 51 meshing with gear 52 on the end of screw shaft 22 for instance. By reversing the motor the screw shafts 19 and 22 may be turned in either direction as desired, advancing the shifting carriages in either direction on said screw shaft and by means of the clutch mechanism disclosed either one of said screw shafts may be actuated at will.

Fig. 5 illustrates a modification wherein instead of a double shifting carriage, shifting carriages containing single sheaves are used, two screw shafts being supported on the girders 13 at each side instead of one screw shaft as shown in Fig. 3. The shifting carriages are constructed substantially similarly to the double shifting carriage already described excepting that there is but one sheave mounted on each carriage. The screw shafts 53 and 54 being in different horizontal planes it is necessary that the casting supporting one of the sheaves should avoid the other screw shaft. By this arrangement any one span can be shifted independently of any other.

The shifting control mechanism for the modifications shown in Figs. 5 and 6 is illustrated in Fig. 8 and is supported on a platform 55 comprising a suitable motor 56 having a shaft 57 on which is mounted a gear 58 meshing with a gear 59 on a shaft 60 suitably supported in bearings 61 on the platform 55. Shaft 60 carries gears 62, 63 and 64 each of them splined on shaft 60 and adapted to be shifted by levers 65, 66 and 67 respectively, each of said levers being connected to a lug 68 in slip collar 69 on each of the gears 62, 63 and 64. Gear 62 is adapted to be shifted to engage gear 70 on the end of screw shaft 54. Gear 63 is adapted to engage either gear 71 or gear 72 according to whether it is shifted to the right or to the left. Gear 71 is on a shaft 73 suitably supported on bearing 74 and carrying at its other end a gear 75 meshing with a gear 76 on the end of screw shaft 77. Gear 72 is on a shaft 78 resting in bearings 79 and carrying at its outer end a gear 80 meshing with a gear 81 on screw shaft 53. Gear 64 is adapted to engage gear 82 on screw shaft 83. By reversing the motor and by actuating the shifting levers as disclosed any one of the screw shafts may be actuated to turn in either direction as may be desired.

Each span of the cable may support one or more independently controlled and operable traveling load carriages 84 preferably of the type more fully described in my Patent Number 551,614 dated December 17, 1895, wherein the operator rides on the load carriage and is thus in position to most efficiently operate the same as he is always over the work. This type of load carriage is, however, not essential and any other suitable form may be used such as the well known form of load carriage operated by means of hauling ropes, the winding of said ropes upon a drum causing the apparatus to be moved in either direction. The form of the load carriage and the means for operating the same, both to cause it to travel and hoist, forms no part of this invention and is referred to merely as illustrative of apparatus which may be employed in connection with the cableway structure.

It is within the scope of this invention to substitute single lengths of cableway fastened at each end to the shifting carriages 16, 17, 18 and 19, instead of a continuous cableway crossing and re-crossing the span as illustrated but the latter arrangement is preferable as it permits of a greater equalization of tension on the cable and a greater benefit is obtained from the movement of the shear legs. For instance, as shown in Fig. 1, a twenty ton load deflects the cable on which it rides more than a five ton load, but the tension on the cable is equalized by the slipping of the cable around the sheaves. Stay cables 85, connecting the upper ends of the shear legs, may be provided if desired.

It is clear that by the means disclosed the equilibrium of the cable way is automatically maintained by the weight of the movable shear legs and its parts, including the additional counter-weight 12, if necessary, and that such weight serves to put the necessary tension on the cable.

It is obvious that many modifications of

the apparatus as described and illustrated may be made and I do not restrict myself to the details as shown and described as they are illustrative of one means of carrying out my invention only.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A device for the lifting, moving and depositing of materials, comprising a foundation, supporting-beams hinged thereto and arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried on said supporting-beams, and cables stretched between said girders, the weight of said supporting-beams and girders serving to put the necessary tension on the cables.

2. A device for the lifting, moving and depositing of materials, comprising a foundation, supporting-beams hinged thereto and arranged in pairs at opposite ends of the device, with an inclination away from each other, girders carried on said supporting-beams, and cables stretched between said girders, the weight of said supporting-beams and girders serving to put the necessary tension on the cables, in combination with another cable, stretched between said girders, having means at its ends to permit movement along said girders.

3. A device for the lifting, moving and depositing of materials, comprising a foundation, supporting-beams hinged thereto and arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried on said supporting-beams, and cables stretched between said girders, the weight of said supporting-beams and girders serving to put the necessary tension on the cables, in combination with another cable having a carriage at each end with means carried thereby to move said cable transversely along said girders.

4. A device for the lifting, moving and depositing of materials, comprising a foundation, supporting-beams hinged thereto and arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried on said supporting-beams, and cables stretched between said girders, the weight of said supporting-beams and girders serving to put the necessary tension on the cables, in combination with another cable, a load-carriage supported thereby, and means carried by said carriage for moving itself along said cable.

5. A device for the lifting, moving and depositing of materials, comprising a foundation, supporting-beams hinged thereto and arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried on said supporting-beams, cables stretched between said girders, the weight of said supporting-beams and girders serving to put the necessary tension on the cables, in combination with another cable, a load-carriage supported thereby having means for moving itself along said cable and means at each end of said cable for moving said cable transversely along the girders.

6. A device for the lifting, moving and depositing of materials, comprising supporting pivoted beams at opposite ends of the device, girders connecting said supporting-beams, and stay-cables stretched between said girders, in combination with load-carrying cables, a load carriage supported on each load-carrying cable and having means to move itself along the cable, and means independent of said motive means at the end of each of the latter cables for moving the cable transversely along the girder.

7. A device for the lifting, moving and depositing of materials, comprising supporting means at opposite ends of the device, a load-cable and hauling-ropes connecting said supporting means, and a framework carriage having hauling-pulleys for moving itself along the load-cable by means of the hauling-ropes, in combination with end carriages to which said cables are secured, having means for moving the cables and the load-carriage transversely and means on the load-carriage for rotating the hauling-pulleys.

8. A device for the lifting, moving and depositing of materials, comprising supporting means at opposite ends of the device, a cable and hauling-ropes connecting said supporting means, and a framework carriage having means for moving itself along said cable by means of said hauling-ropes, in combination with a carriage at each end of the cable and means carried by the carriage for moving the cable transversely.

9. A device for the lifting, moving and depositing of materials, comprising supporting-beams arranged in pairs at the opposite ends of the device, girders carried on said beams, a cable stretched between said girders, and a carriage adapted to travel along said cable, in combination with a carriage at each end of said cable, a track along which said carriage travels and means carried by the carriage to propel itself along said track.

10. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device and a cable stretched between said supports crossing and recrossing the space between them.

11. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device, one of said supports being movable longitudinally of the primary supporting means therefor, a load cable stretched between said supports

crossing and recrossing the space between them and means for equalizing the tension on the cable when a load is on any portion thereof.

12. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device, a cable stretched between said supports crossing and recrossing the space between them and means intermediate the ends of the cable for shifting the individual spans.

13. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device, a cable stretched between said supports crossing and recrossing the space between them, means intermediate the ends of the cable for shifting the individual spans and means for equalizing the tension on the cable when a load is on any portion thereof.

14. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device, one of said supports being adapted to rock longitudinally upon its base, stay cables connecting said supports at each side thereof, a load cable stretched between said supports crossing and recrossing the space between them and means for equalizing the tension on the cable when a load is on any portion thereof.

15. A device for the lifting, moving and depositing of materials, comprising supports at opposite ends of the device with an inclination away from each other and capable of rocking from their bases and a load cable stretched between said supports crossing and recrossing the space between them, stay cables connecting said supports at their sides thereof, the weight of said supports serving to put the necessary tension on said cables.

16. A device for the lifting, moving and depositing of materials, comprising a foundation, supports hinged thereto at opposite ends of the device with an inclination away from each other, stay cables connecting said supports at their sides thereof, a load cable stretched between said supports crossing and recrossing the space between them and means for equalizing the tension on said cables when a load is on any portion thereof, the weight of said supports serving to put the necessary stretching tension on said cables.

17. A device for the lifting, moving and depositing of materials, comprising counterweighted supports at opposite ends of the device with an inclination away from each other one of said supports being adapted to rock upon its base, a cable stretched between said supports crossing and recrossing the space between them, means for equalizing the tension upon the cable when a load is on any portion thereof, means intermediate the ends of the cable for shifting the individual spans; the weight of the counterweighted supports serving to put the necessary stretching tension on the cable.

18. A device for the lifting, moving and depositing of materials, comprising shear legs arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried by said shear legs connecting the upper ends thereof, a cable stretched between said girders crossing and recrossing the space between the pairs of shear legs and traveling carriages supported on said girders for shifting the individual spans of the cable intermediate the ends thereof the weight of said shear legs and girders serving to put the necessary tension on the cable.

19. A device for the lifting, moving and depositing of materials, comprising shear legs arranged in pairs at opposite ends of the device with an inclination away from each other, girders carried by said shear legs connecting the upper ends thereof, a cable stretched between said girders crossing and recrossing the space between the pairs of shear legs, traveling carriages supported on said girders for shifting the individual spans of the cable intermediate the ends thereof and sheaves carried by said traveling carriages permitting the cable to slide thereover, the weight of the shear legs and girders serving to put the necessary tension on the cable.

20. A device for the lifting, moving and depositing of materials, comprising shear legs arranged in pairs at opposite ends of the device with an inclination away from each other, one of said pairs of shear legs being anchored against movement and the other of said pairs of shear legs being adapted to oscillate on its base, stay cables connecting said shear legs at each of their sides thereof, a counterweight carried by the oscillating shear legs and a load cable stretched between said pairs of shear legs crossing and recrossing the space between them, the oscillating shear legs being adapted to put the necessary tension on said cables, a bridge connecting said shear legs at their upper ends thereof, and traveling carriages carried by said bridge adapted to travel transversely of said bridge.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM F. BROTHERS.

Witnesses:
SEABURY C. MASTICK,
ROBERT W. ASHLEY.