

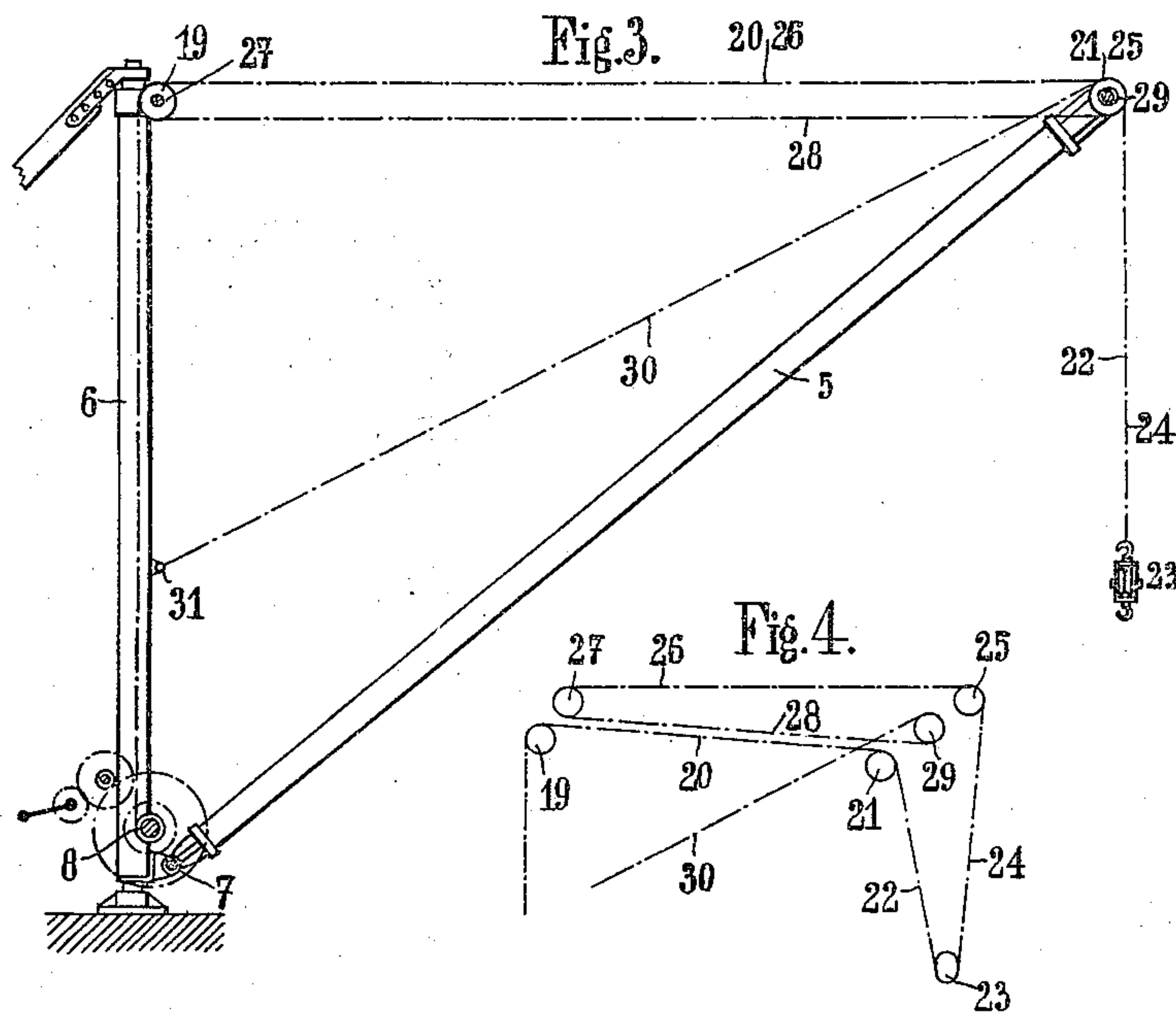
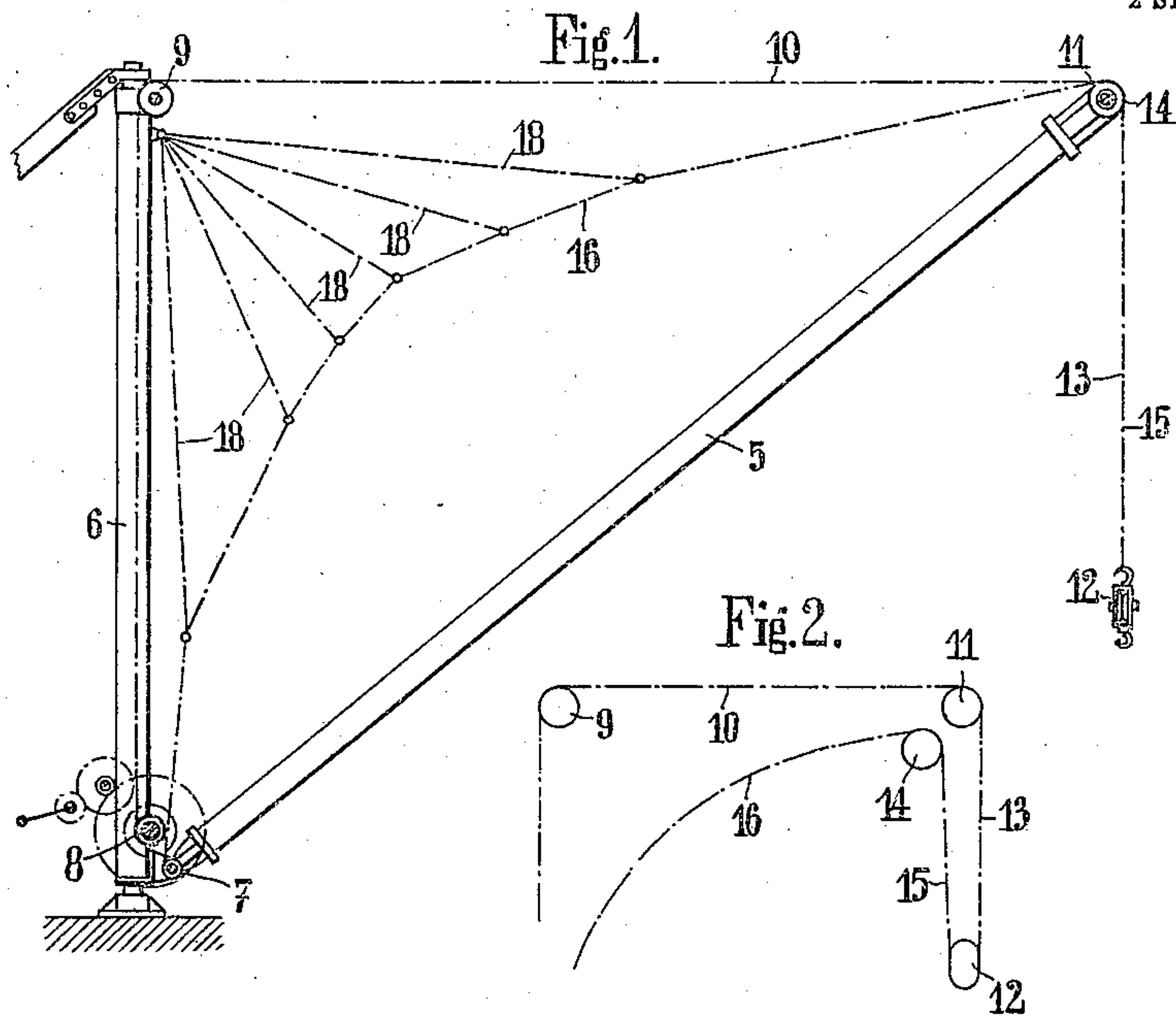
S. VOSS.
CRANE.

APPLICATION FILED JAN. 21, 1908.

952,850.

Patented Mar. 22, 1910.

2 SHEETS—SHEET 1.



Witnesses
Edmund L. Jewell
J. H. Kelly

Inventor
Samuel Voss
By W. F. Schenckhorn
Atty.

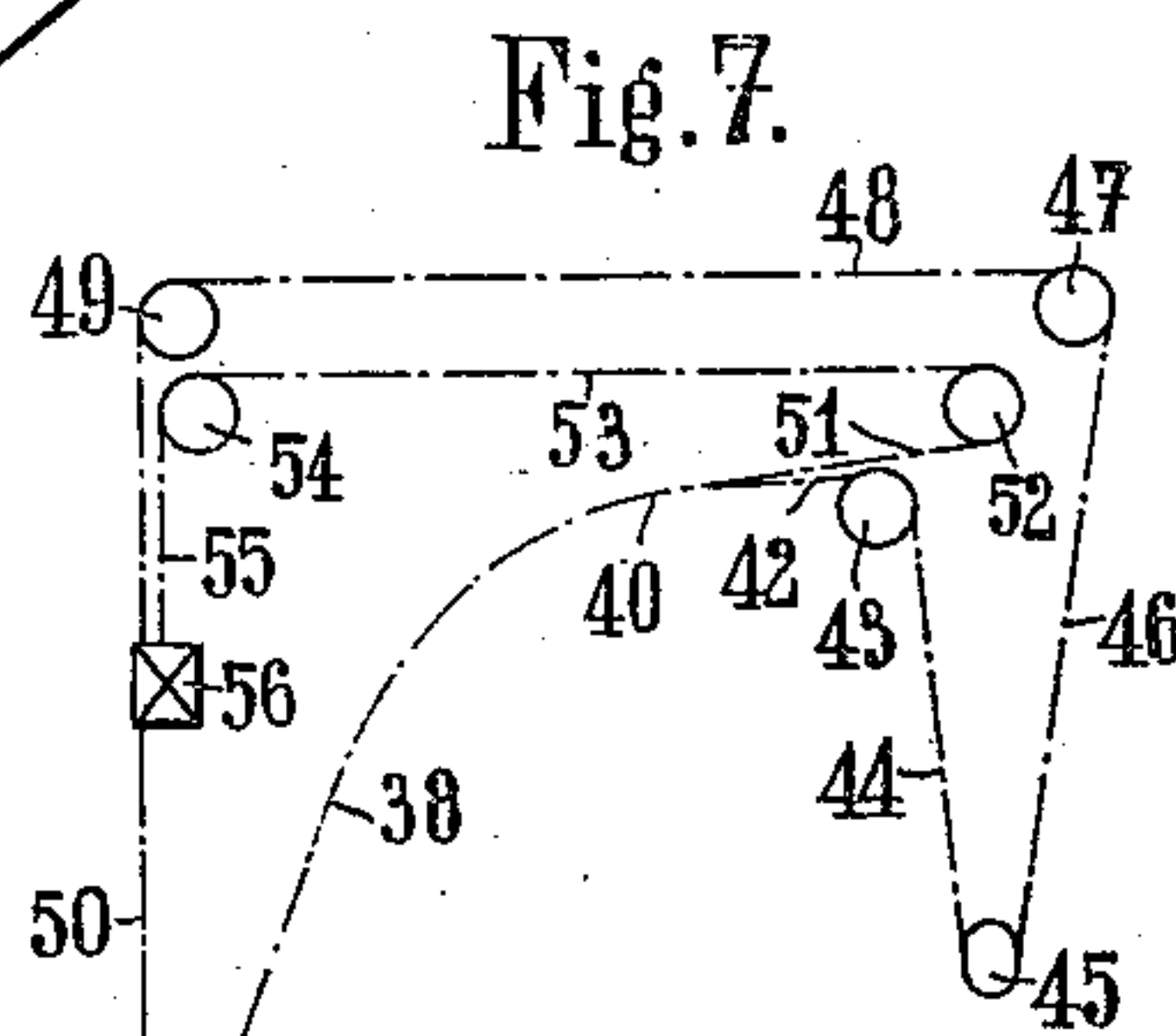
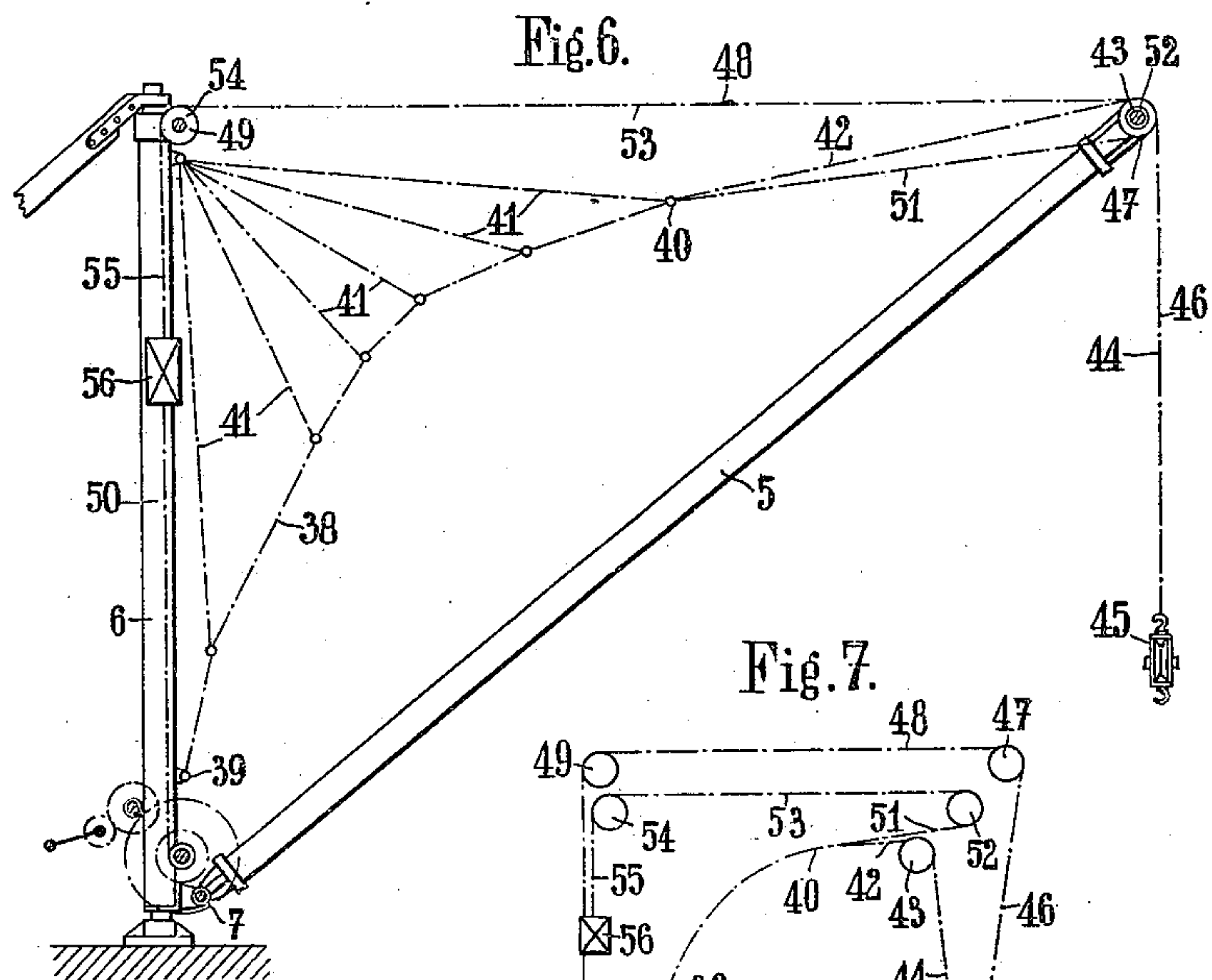
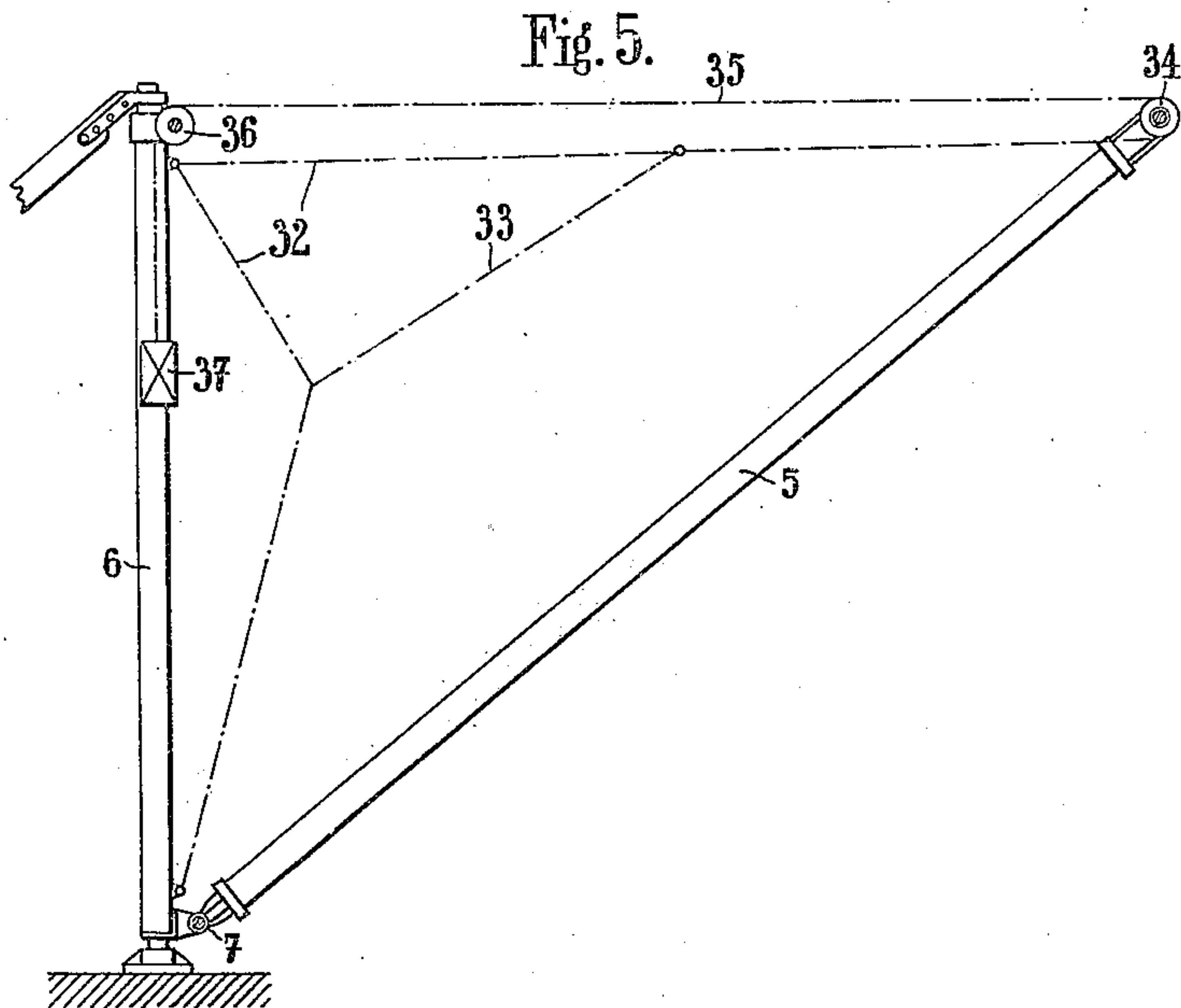
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

SAMUEL VOSS, OF PANKOW, NEAR BERLIN, GERMANY.

CRANE.

952,850.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed January 21, 1908. Serial No. 411,933.

To all whom it may concern:

Be it known that I, SAMUEL VOSS, a subject of the King of Prussia, and a citizen of the German Empire, residing at Pankow, near Berlin, in the Kingdom of Prussia and German Empire, have invented new and useful Improvements in Cranes, of which the following is a specification.

In cranes of the derrick type, or other cranes which have jibs that are capable of being swung up or down in a vertical plane, the jib has hitherto been raised or lowered by means of special tackle. In these cranes the hoisting rope runs from the windlass, placed at the foot of the crane-post, directly, or over a guide roller, to a sheave journaled at the head of the jib, and from there generally around a loose sheave to which the load is hung, and then back to the head of the jib where it is fixed. The tension in the parts of the rope running from the load and from the crane-post to the head of the jib, and the direction of these rope parts produce together with the weight of the jib, a moment which tends to lower the jib. This moment is overcome by the aforesaid tackle by which the lowering or raising of the jib is effected.

My invention consists in this that I lead that part of the hoisting rope, that has been hitherto fixed to the head of the jib, in a curved line to the crane-post, which curve is so shaped that the load exerts no moment on the jib in any position of the latter. As it is difficult to maintain a rope constantly in a curved line and as an approximate balancing of the moment of the load on the jib is sufficient for the intended purpose, I preferably lead the part of the hoisting rope which extends from the head of the jib to the crane-post, in a bent line which I support at various points by tension ropes. Under some circumstances, as when for instance the course of the hoisting rope is not so simple as I have described it in the introduction hereto, but a tackle of several sheaves is introduced between the crane-post and the head of the jib, the balancing curve becomes so flat that it may be superseded by a straight rope, which is, however, led in a direction different from that of the other ropes of the tackle. As according to my invention the load does not exert a moment on the jib in any position of the latter, it becomes possible to raise and lower the jib without the load having any effect upon the rising and falling. There is then only

the frictional resistance and the weight of the jib to overcome when raising or lowering the latter. Furthermore the weight of the jib can be balanced in the same way by my invention. For this purpose I lead a rope from the crane-post over a sheave at the head of the jib to a second sheave journaled on the crane-post, and I fix a counter-weight to the end of this rope. The part of the rope that goes from the crane-post to the sheave at the head of the jib I carry in such a curved form that the weight of the jib is balanced by the counter-weight in every position. This curve can also be approximated to by a bent line. It is also possible to employ a single rope led in a curve or bent line in order to balance the moment of the load on the jib as well as the weight of the jib itself by means of a counter-weight. The rope running from the crane-post to the head of the jib in a curve has then two ends, one of which serves as hoisting rope and the other to carry the counter-weight of the jib.

Figure 1 of the drawing shows the elevation of a crane in which the moment of the load on the jib is approximately balanced by a rope led in a bent line. Fig. 2 shows the course of the rope of Fig. 1 with the sheaves shown in perspective. Fig. 3 shows a case in which the moment of the load on the jib is approximately balanced by a rope led in a straight line from the head of the jib to the crane-post. Fig. 4 shows the corresponding perspective view of the course of the rope. In Fig. 5 is shown the balancing of the weight of the jib by a counter-weight. In Fig. 6 is shown the balancing of the moment of the load on the jib and of the weight of the jib by a rope common to both, led in a bent line, and Fig. 7 shows a perspective view of the course of the rope shown in Fig. 6. The figures are not shown to scale.

The crane-jib 5, Figs. 1 and 2 is hinged to the crane-post 6 at the point 7. The hoisting rope is led from the drum 8 of the windlass to the sheave 9, thence by the part 10 of the rope to the sheave 11 at the head of the jib, around the loose sheave 12, by the part 13 of the rope, then to the second sheave 14 at the head of the jib by the part 15 of the rope, and thence in the bent line 16 to a fixed point on the crane-post. The tension ropes 18 define the angles of the bent line. It will be seen that the shape of the curved line to which the line 16 approxi-

mates is so designed that the difference between the moment of the rope part 16 going from the sheave 14, and the moments of the rope parts 10, 13 and 15 in relation to the point 7 amounts to zero. It will also be seen that the balance is theoretically quite independent of the varying amount of the load if the exact curve is supposed to be substituted for the bent line 16. If the jib 5 is raised the tension ropes 18 become slack one after the other and in any position the part 16 of the rope runs from the sheave 14 in a direct line to the highest angle point of the line 16 the tension rope 18 of which is still in tension.

In the arrangement shown in Figs. 3 and 4 the hoisting rope is led from the windlass to the sheave 19, thence by the rope part 20 to the sheave 21 at the head of the jib, then by the rope-part 22 to the loose sheave 23, thence by the rope-part 24 to the sheave 25 at the head of the jib, then by the rope-part 26 to the sheave 27 at the head of the crane-post, then by the rope-part 28 to the sheave 29 at the head of the jib, and by the rope-part 30 to the fixed point 31 on the crane-post. The rope-part 30 is thereby led in a direction which cuts or deviates from the direction of the rope-parts 20, 26 and 28.

In Fig. 5 the rope for the counter-weight for the jib is led from the foot of the crane-post onto the bent line 33, which is held fast by the tension ropes 32 and to the sheave 34 at the head of the jib, thence by the rope-part 35 to the sheave 36 at the head of the crane-post, and from there to the counter-weight 37. The moment exerted by the weight of the jib 5 on the point 7 is, in consequence of this arrangement, balanced in every position of the jib. This arrangement of counter-weight may be employed with the load hoisting rope arrangement shown in Fig. 1 or Fig. 3, on the same crane.

In the arrangement shown in Figs. 6 and 7 the rope-part 38 is fixed at the point 39 of the crane-post and is led in a bent line to the point 40, being held by the tension ropes 41. From the point 40 the hoisting rope is led by the part 42 to the sheave 43 at the head of the jib, by the rope-part 44 to the loose sheave 45, by the rope-part 46 to the sheave 47 at the head of the jib, by the rope-part 48 to the sheave 49 at the head of the crane-post and by the rope-part 50 to the windlass. The counter-weight rope is on the contrary led from the point 40 by the rope-part 51 over the sheave 52 at the head of the jib, by the rope-part 53 to the sheave 54 at the head of the crane-post, and by the rope-part 55 to the counter-weight 56. In this arrangement with a single rope led in a bent line the moment of the load and the moment of the jib are balanced in relation to the point 7 in all positions of the jib. If it is desired to move the load outwards from

or inwards towards the crane-post, the jib follows the movement of the load without there being any other resistance to overcome than that of friction, and the load remains always at the same height while the jib is being moved.

It will be seen from the foregoing disclosure that the device does not depend upon the lengths of the ropes or cables 18, 32 and 41, but on the direction of ropes 16, 30, 33, 38, 42 and 51. Referring to Figs. 1 and 2 of the drawings in each position of the jib 5 are known the tensions and directions of ropes 10, 13 and 15 and the tensions of the ropes 16; only the direction of the rope is unknown and is to be determined. This determination is made, for example, by calculating the moments exerted by ropes 10, 13 and 15 onto jib 5 and by dividing the difference of the moments of ropes 13 and 15 minus the moment of ropes 10, by the tension of rope 16. The quotient is to be made the length of the perpendicular from point 7 to the direction of rope 16. By determining the above way the direction of rope 16 in as many positions of the jib 5 as may be found sufficient, the broken line of rope 16 is determined; then the edges of the broken line are jointed by ropes 18 to a suitable point on the crane post. By the same manner are determined the directions of the broken-line-ropes in Figs. 5 and 6. In Fig. 3 the broken line after being determined is approximated by a suitable straight line.

My invention may be carried out in a variety of ways without departing from its essential feature, for example, the rope which is led in a more or less curved form, may be fixed to the lower end of the jib, or to a part connected movably with the crane-post instead of the crane-post itself.

I claim:

1. In cranes the combination of a crane-post with a jib pivoted thereto, a hoisting rope a part of which is led from the said crane-post to the head of the said jib, and a plurality of tension ropes fixed to the crane-post and holding separate points of the said part of the hoisting rope.

2. In cranes the combination of a crane-post with a jib pivoted thereto, a hoisting rope a part of which is led from the said crane-post to the head of the said jib in such a bent line, that the moment of the parts of the hoisting rope extended between the crane-post and the head of the jib, in relation to the pivot of the jib, is nearly equal to the moment of the load in relation to the same point, in all positions of the jib.

3. In cranes the combination of a crane-post with a jib pivoted thereto, a hoisting rope, a part of which runs from the said crane-post over a tackle interposed between the crane-post and the head of the jib, and

a part of which runs from the head of the jib to the crane-post in a direction so deviating from that of the ropes of the said tackle that the moment of the parts of the hoisting rope running from the head of the jib to the crane-post, in relation to the pivot of the jib is approximately equal to the moment of the load in relation to the same point, for all positions of the jib.

10 4. In cranes the combination of a crane-post with a jib pivoted thereto, a counter-weight, a rope connecting said jib with said counter-weight and extended between said crane-post and the head of said jib in a bent line so shaped, that the moment of the parts of the said rope led from the head of said jib to said crane-post, in relation to the pivot of the jib, is equal or nearly equal to the moment of the weight of said jib, in
20 relation to the same point, for all positions of the jib.

5. In cranes the combination of a crane-post with a jib pivoted thereto, a counter-weight a forked rope one end of which connects said jib with said counter-weight and the other end of which is led to a windlass, said forked rope being carried in such a bent line from said crane-post to the head of said jib, that the moment of the parts of the rope led from the head of the jib to the crane-post, in relation to the pivot of the jib, is equal or nearly equal to the moment of the load and the weight of the jib, in relation to the same point, for all positions of the jib.

In witness whereof I have hereunto set my hand in presence of two witnesses.

SAMUEL VOSS.

Witnesses:

FELIX NEUBAUER,

FRIEDRICH HOLZSTAMM.