No. 825,353.

PATENTED JULY 10, 1906.

B. SCHLESINGER & E. G. WELDON.

SAFETY GEAR FOR MINE SKIPS, CAGES, &c.

APPLICATION FILED DEC. 20, 1904.

5 SHEETS—SHEET 1.

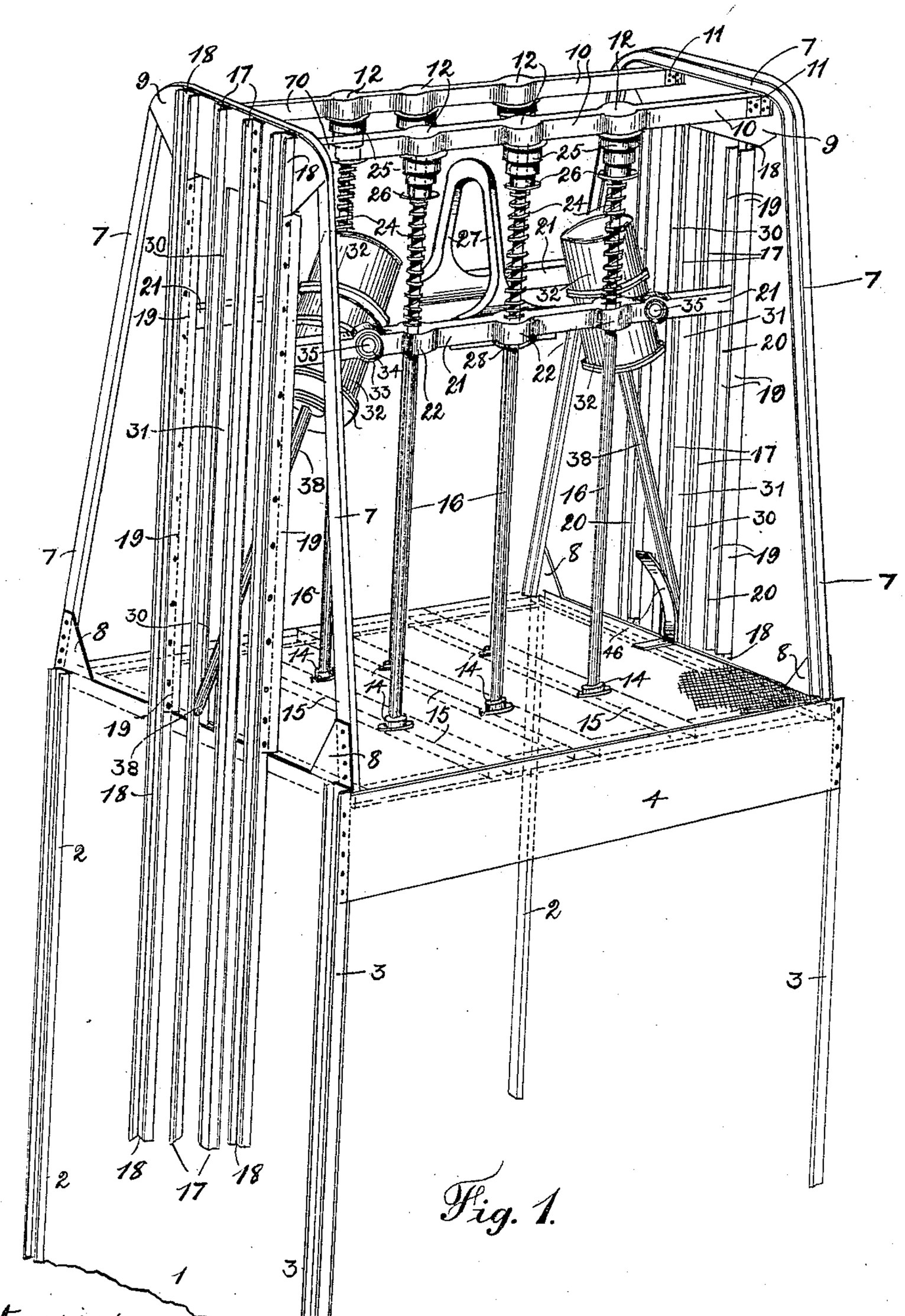

Fig. 1.

Witnesses:

R. Ovendale.

Fred Ovendale

Inventors:
Bruno Schlesinger
Edwin George Weldon
by Chas. Ovendale.
Attorney

No. 825,353. PATENTED JULY 10, 1906.

B. SCHLESINGER & E. G. WELDON.

SAFETY GEAR FOR MINE SKIPS, CAGES, &c.

APPLICATION FILED DEC. 20, 1904.

5 SHEETS—SHEET 2.

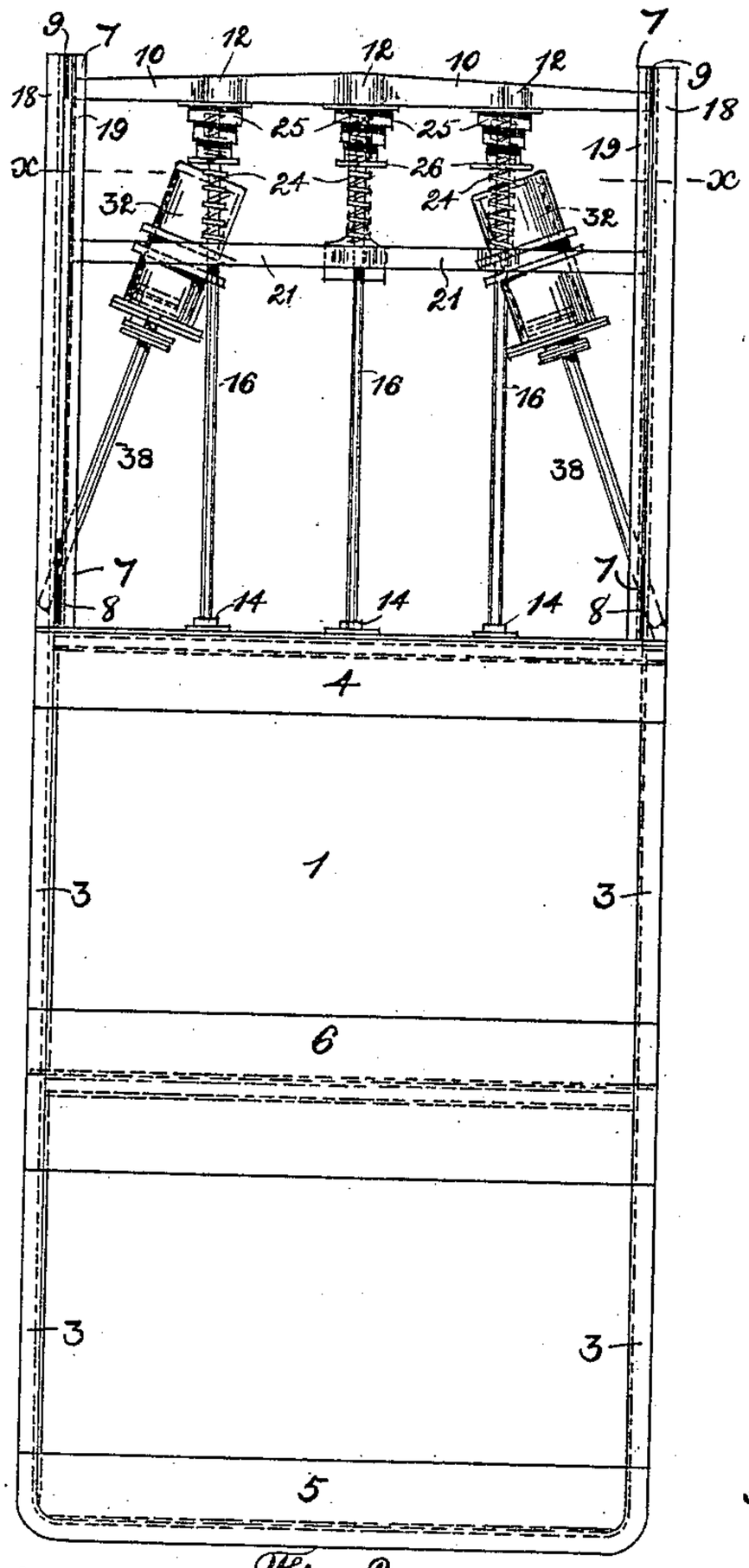

Fig. 2.

Fig. 3.

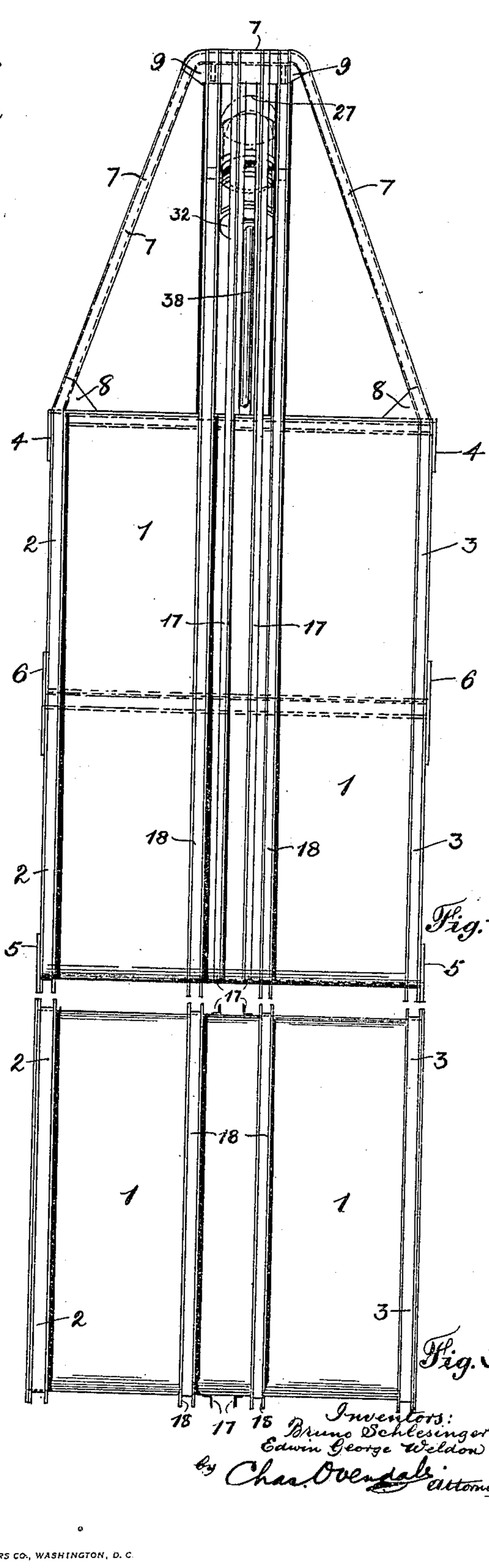

Fig. 4.

Fig. 5.

Witnesses:
Fred Ovendale
Fred Ovendale

Inventors:
Bruno Schlesinger
Edwin George Weldon
by Chas. Ovendale Attorney

No. 825,353.

PATENTED JULY 10, 1906.

B. SCHLESINGER & E. G. WELDON.

SAFETY GEAR FOR MINE SKIPS, CAGES, &c.

APPLICATION FILED DEC. 20, 1904.

5 SHEETS—SHEET 3.

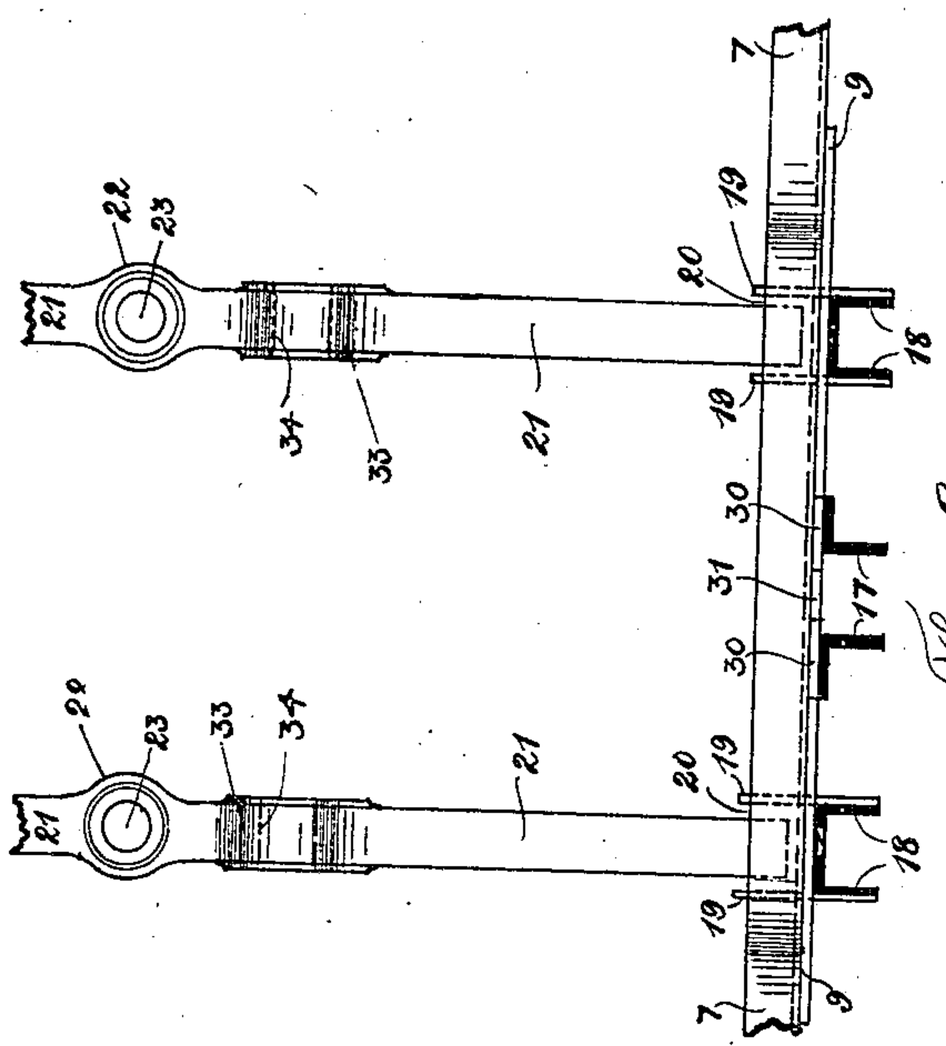

Fig. 8.

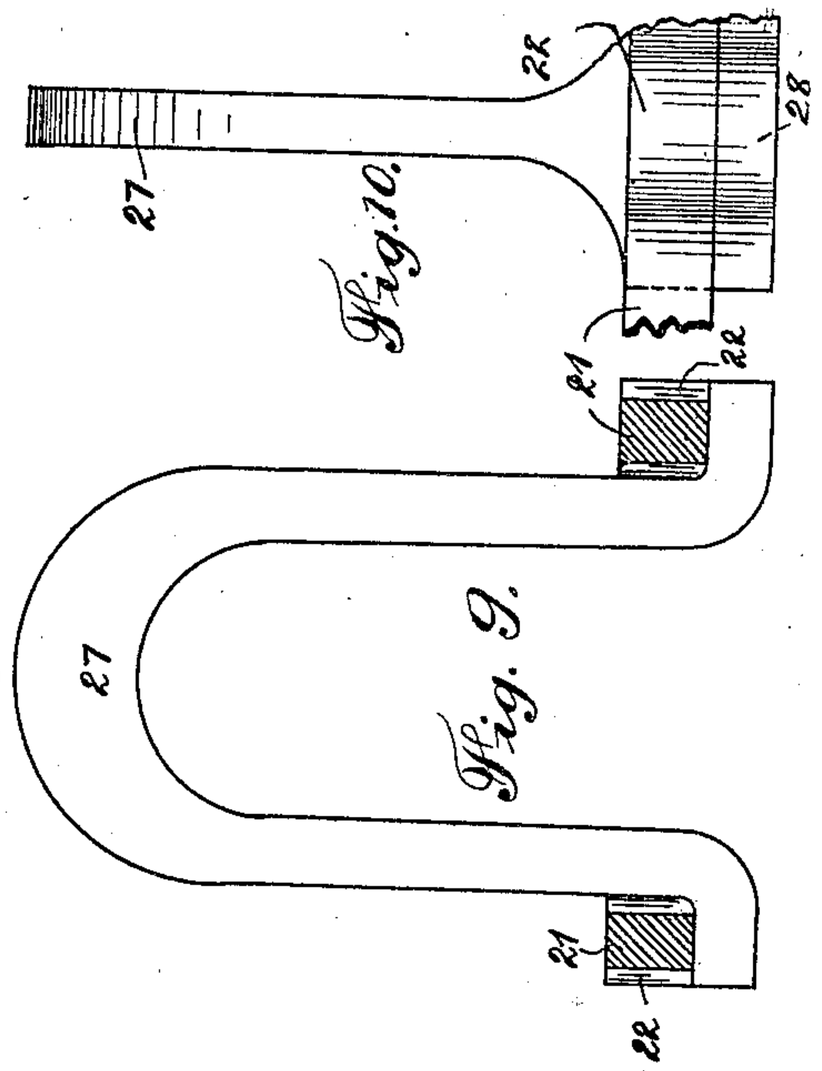

Fig. 10.

Fig. 9.

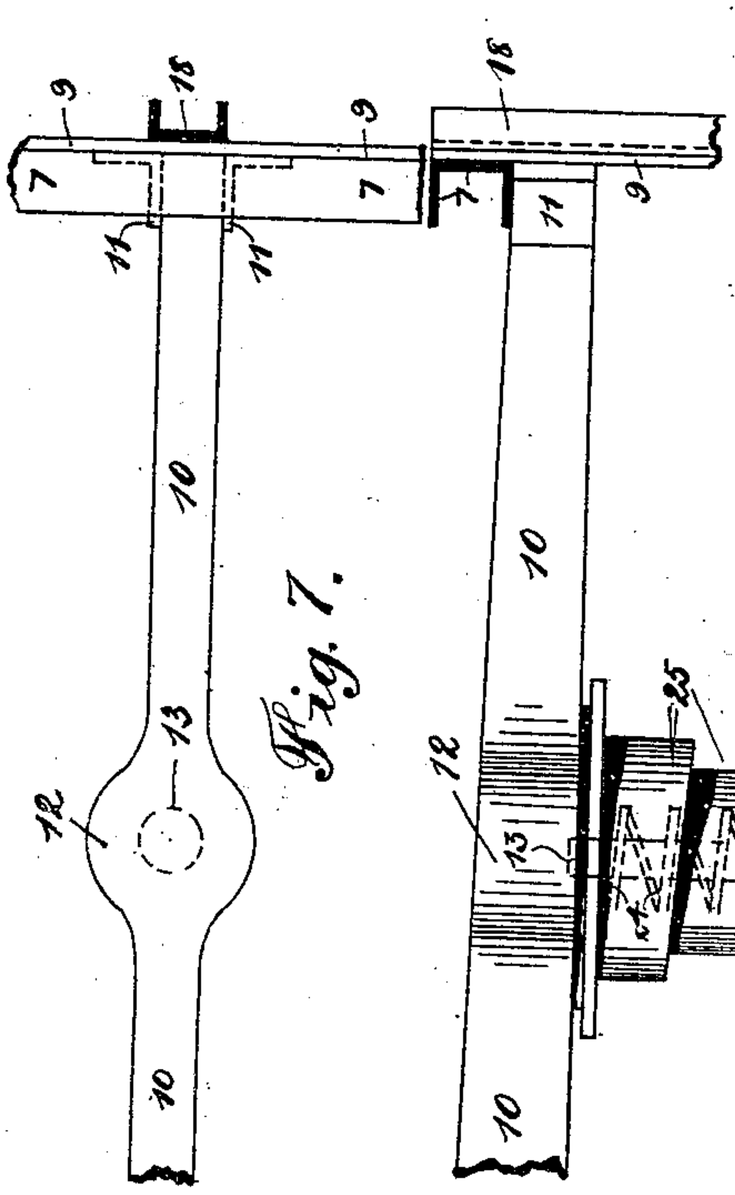

Fig. 7.

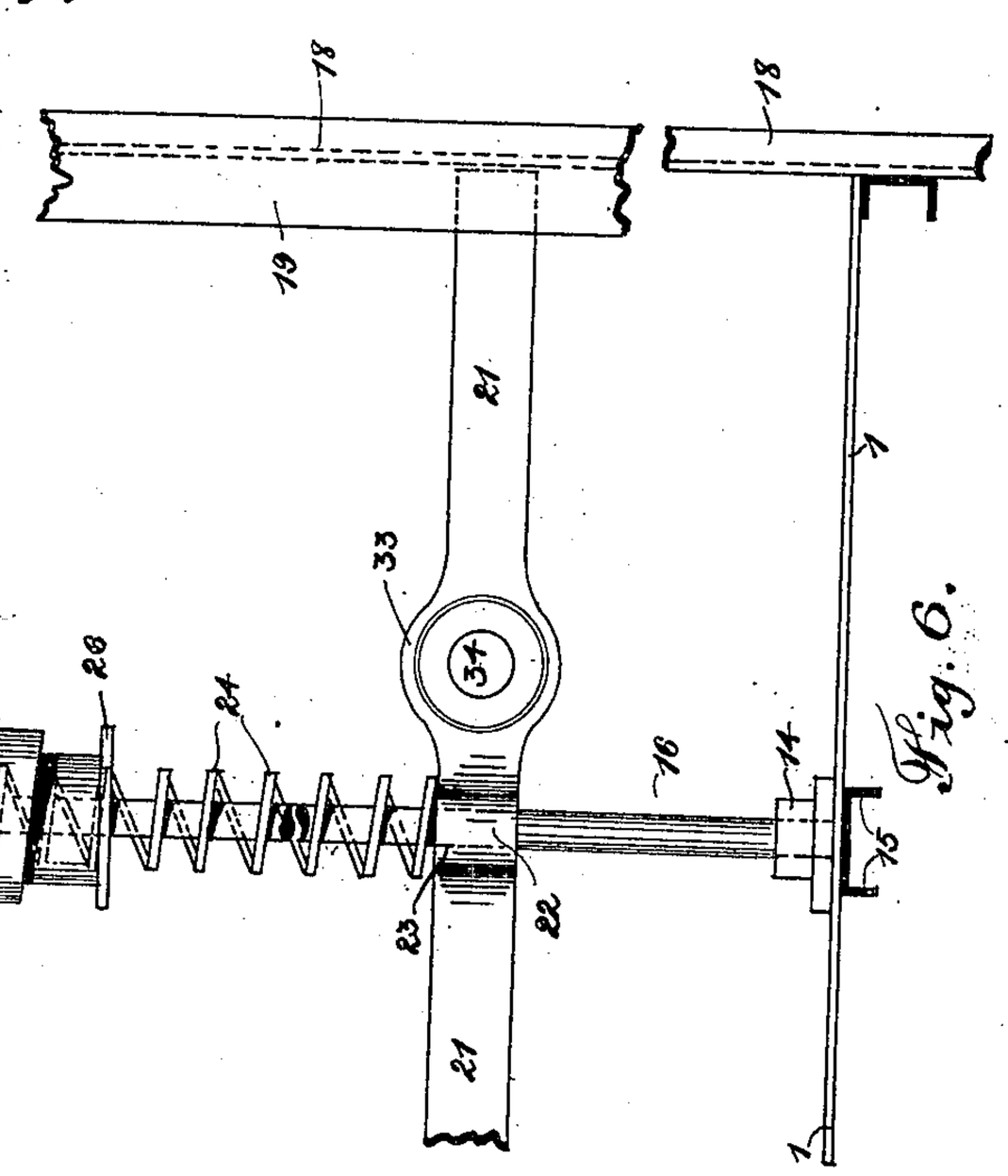

Fig. 6.

Witnesses:

W. Ovendale.

Fred Ovendale

Inventors:

Bruno Schlesinger

Edwin George Weldon

by Chas. Ovendale

Attorney

No. 825,353.

PATENTED JULY 10, 1906.

B. SCHLESINGER & E. G. WELDON.

SAFETY GEAR FOR MINE SKIPS, CAGES, &c.

APPLICATION FILED DEC. 20, 1904.

5 SHEETS—SHEET 4.

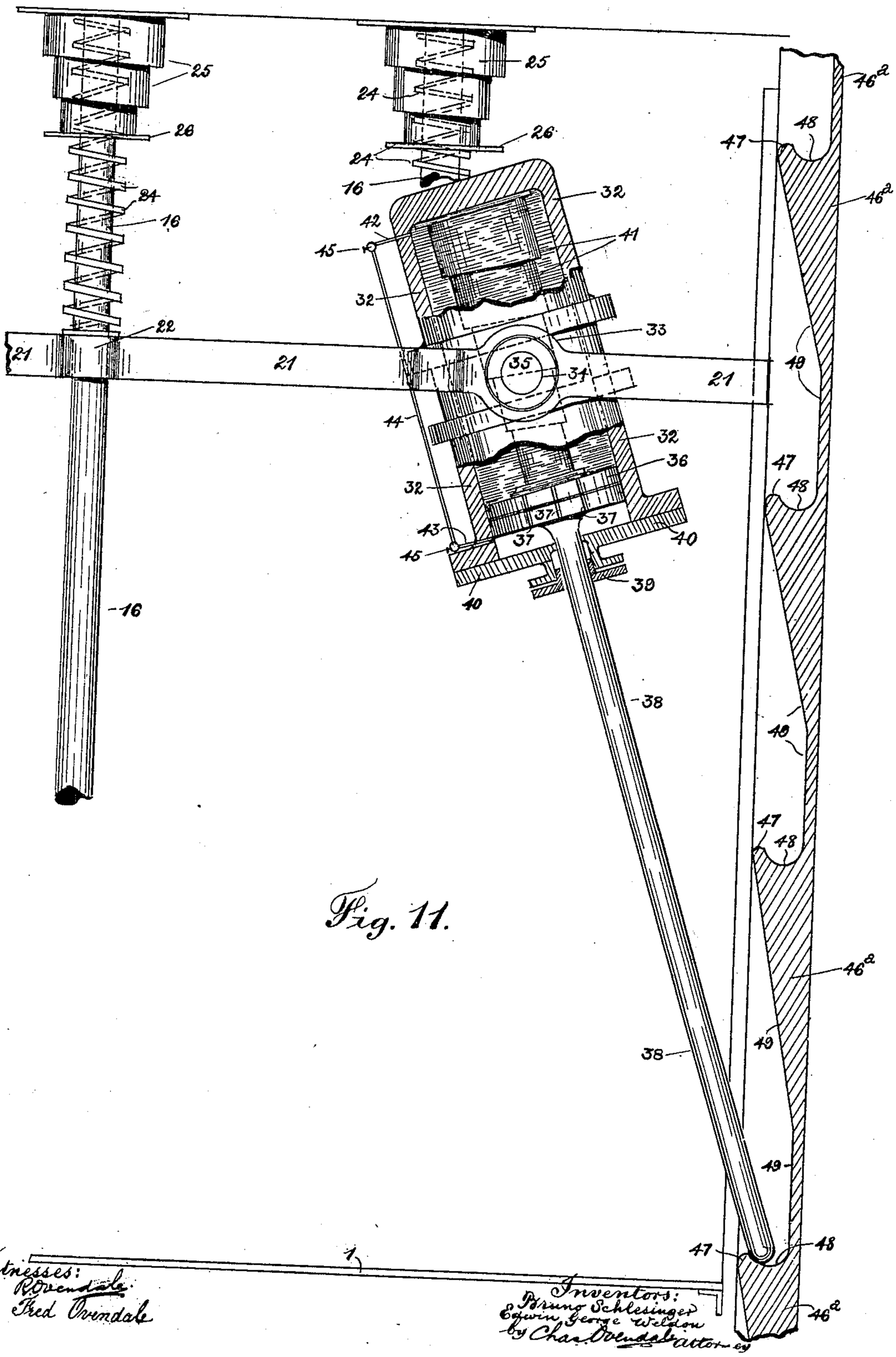

Fig. 11.

Witnesses:
R. Orendale.
Fred Orendale

Inventors:
Bruno Schlesinger
Edwin George Weldon
by Chas. Orendale Attorney

No. 825,353.

PATENTED JULY 10, 1906.

B. SCHLESINGER & E. G. WELDON.

SAFETY GEAR FOR MINE SKIPS, CAGES, &c.

APPLICATION FILED DEC. 20, 1904.

5 SHEETS—SHEET 5.

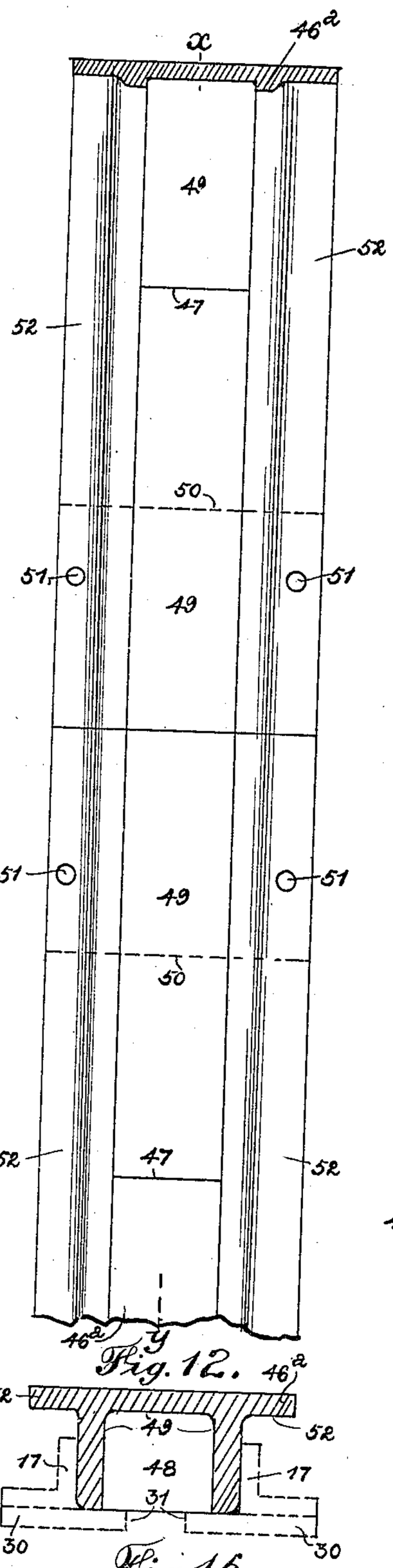

Fig. 12.

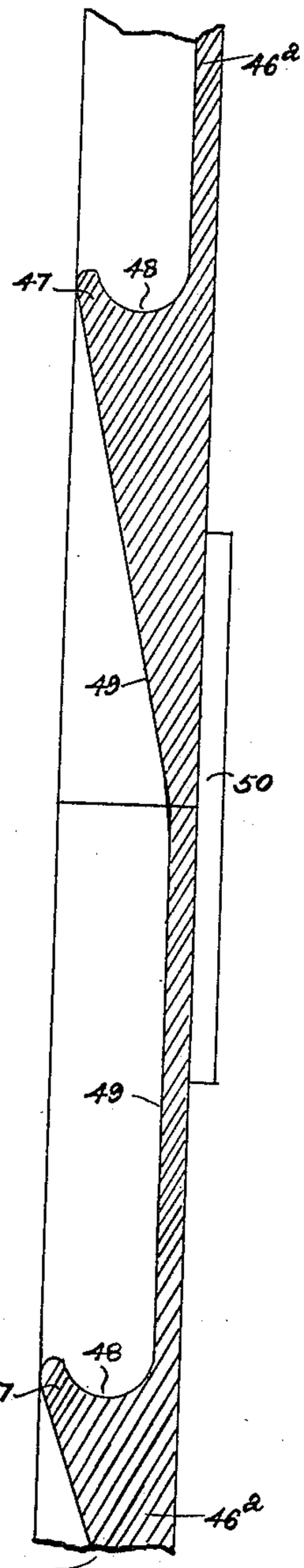

Fig. 13.

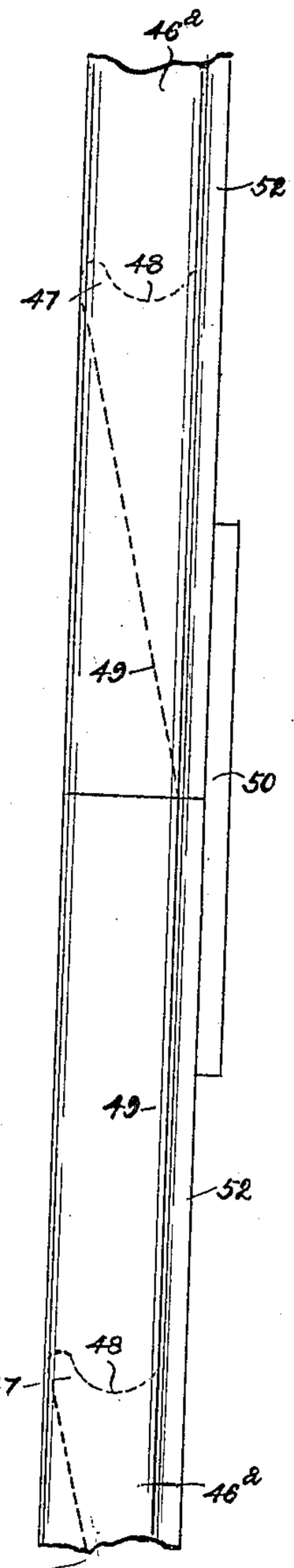

Fig. 14.

Witnesses:
R. Ovendale.
Fred Ovendale

Inventors:
Bruno Schlesinger
Edwin George Weldon
by Chas. Ovendale.
Attorneys

UNITED STATES PATENT OFFICE.

BRUNO SCHLESINGER AND EDWIN GEORGE WELDON, OF JOHANNESBURG, TRANSVAAL.

SAFETY-GEAR FOR MINE SKIPS, CAGES, &c.

No. 825,353. Specification of Letters Patent. Patented July 10, 1906

Application filed December 20, 1904. Serial No. 237,716.

To all whom it may concern:

Be it known that we, BRUNO SCHLESINGER, a subject of the Emperor of Austria-Hungary, and EDWIN GEORGE WELDON, a subject of the King of England, residing at Johannesburg, Transvaal, have invented certain new and useful Improvements in Safety-Gear for Mine Skips, Cages, and the Like, of which the following is a specification.

This invention relates to safety-gear applicable for the skips or cages employed in the shafts of mines, for elevators or lifts, or like contrivances which traverse guide-rails or runners, and to other similar apparatus.

The present invention is designed with the object of providing a thoroughly efficient safety-gear which may be relied upon at all times and under all ordinary circumstances to bring the skip, cage, elevator, lift, or the like to rest within a short distance upon the breaking of the hauling-rope or in the event of the skip, cage, elevator, lift, or the like becoming detached from the rope from any cause, so that it becomes unsuspended thereby in the shaft of the mine, the well of the elevator or lift, or otherwise.

An important point in our invention, in which we differ from many of the safety-gears at present in use, is that we utilize the energy of the unsuspended or falling load to arrest the movement of the same or to bring it to rest in the shaft, &c.

In applying our invention, say, to a mine skip or cage we prefer to locate the safety mechanism or gear above the skip or cage, although it may, if found more convenient, be located beneath the same.

The frame in which the cage is built or carried is preferably carried up above the top of the cage for a suitable distance. Across the top of the frame above the skip or cage are riveted or otherwise securely fixed two horizontally-disposed bars. Between these bars on the top of the cage, which is strengthened to afford them a firm fixing, are arranged three (more or less) vertically-disposed rods or bars. On these two sets of vertical rods are mounted two horizontally-arranged rods, which rods are capable of moving vertically on the guide-rods within certain limits. On each of the guide-rods, between the sliding or movable bars and the fixed or stationary bars in the upper portion of the frame, are arranged two (more or less) coiled springs, the one a powerful buffer-spring and the other a less powerful spring, whose functions will be hereinafter explained. The two sliding or movable bars at their extremities move in angle, channel, or other suitably-shaped guides or slots. The two sliding or movable bars are connected by means of a bow which serves as the means for connecting the hauling-rope to the skip, cage, or the like. Arranged between and carried by the two sliding bars are two oscillating cylinders arranged inside the frame in proximity to the ends of said bars. The cylinders are constructed with trunnions or pivots which work in bearings provided therefor in the sliding bars. In each of the cylinders is arranged a piston which is attached to a piston-rod, which latter operates when the rope breaks or the skip or cage becomes unsupported from above to bring the same to rest by engaging the guide-rails or runners in the shaft of the mine, &c. Inside each of the oscillating cylinders is located a suitably strong coiled spring, and the cylinders are filled with oil or other suitable liquid or gaseous fluid.

We prefer to employ guide-rails or runners formed with teeth or projections on their front faces at suitable distances apart. The tooth or projection on the inside is rounded or curved, and the front edge is rounded off, so as to insure the extremity of the piston-rod when it is moved outward and thrown forward being brought into engagement therewith to support the load and so that in the event of the piston-rod striking on the edge of a tooth or projection it is thereby deflected into engagement with the next succeeding tooth or projection. From the rounded edge of the tooth or projection the guides are inclined inward and downward at a suitable inclination and for a suitable distance and then continue in the form of a straight or parallel strip into the curved recess formed in the top of the next tooth or projection.

In order the more clearly to describe our invention in detail, we have fully illustrated it in one form in the accompanying sheets of drawings, by the aid of which we will now proceed to describe the construction and arrangement of the several parts of the gear or mechanism.

In the drawings, Figure 1 is a perspective

view of an arrangement embodying our invention. Fig. 2 is a side elevation of the arrangement. Fig. 3 is a sectional plan of Fig. 2 on line $x\,x$ with the springs removed. Fig. 4 is an end elevation or a view taken at right angles to Fig. 2. Fig. 5 is a plan of the bottom of the skip and its supporting-frame. Fig. 6 is a side elevation of a certain portion of the safety mechanism. Fig. 7 is a plan of one of the horizontally-arranged rods, showing the means of fixing it to the frame. Fig. 8 is a plan of a portion of the two sliding rods and their guideways. Fig. 9 is a side elevation of the bow, showing the means of attaching it to the sliding rods. Fig. 10 is a side elevation of the bow shown in Fig. 9. Fig. 11 is an elevation, partly in section, of one of the oscillating cylinders and illustrating the means of attaching same to the sliding rods and showing the piston-rod engaging the teeth, stops, or projections on the guide-rails or runners. Fig. 12 is a front elevation of a portion of the guide-rails. Fig. 13 is a vertical section on line $x\,y$ of Fig. 12, and Fig. 14 is a side elevation of Fig. 12, and Fig. 15 is a sectional plan of Fig. 12.

The skip, cage, elevator, lift, or the like, 1, may be constructed of any desired capacity and shape. In the accompanying drawings we illustrate it built up in two rectangular frames 2 3 of U section and strengthened by means of plates 4 5 at the top and bottom and an intermediate plate 6 at or about the center. It may be of any other preferred construction.

In the drawings we show the safety-gear located in a framing 7 at the top of the skip or cage 1. The framing 7 for the safety-gear is shown riveted to extensions or projections 8, provided on the plates which form the sides of the skip. In the top of the frame 7 at either end are riveted the plates 9. Arranged across the frame or between the plates 9 are the two horizontally-disposed bars 10. These bars are shown fixed by means of small angle pieces or brackets 11 to the plates 9 underneath the top of the frame 7. The bars 10 are formed with three enlargements or bosses 12 and with holes or recesses 13 in the under side of said bosses 12.

On the top of the skip or cage 1 are fixed sockets 14, which are carried or supported by the three horizontally-arranged supports 15 of U section. These sockets 14 coincide with or lie immediately beneath the holes 13, formed in the two fixed bars 10. Between the fixed bars 10 and the horizontal supports 15 are arranged six (more or less) guide-rods 16, three for each bar 10. The guide-rods 16 at their upper extremities project into the holes 13, formed in the bosses 12, and their lower extremities rest in the sockets 14.

To those sides of the skip 1 which face the guide-rails or runners are fixed the shoes 17, which are of L section and are carried above the top of the skip 1 and at their upper ends are riveted to the plates 9 and frame 7, and the pieces of U section 18, fixed at either side of the shoes 17, which pass down one side of the skip 1, underneath the same, and up the other side and are riveted or otherwise fixed at the top to the plates 9. (See Figs. 4 and 5.) To each side of the U-pieces 18 at either side of the shoe 17 are riveted plates 19, which on the inside of the framing 7 form longitudinal grooves or recesses 20.

On the rods 16 are arranged two horizontal rods 21. These rods 21 are formed with bosses or enlargements 22 and with holes 23, in which they may slide vertically on the rods 16. The ends of these sliding rods 21 project into the guides or recesses 20, formed by the plates 19.

Round each of the several rods 16, between the stationary bars 10 and the sliding bars 21, are placed spiral springs 24, which at their lower ends bear against the tops of the sliding bars 21 and at their upper ends rest on the under side of the fixed bars 10. The springs 24 are such that their united force is somewhat less than the weight of the empty skip or cage, and the springs 24 are somewhat shorter in length than the distance between the top of the skip or cage and the top of the framing 7, in which the safety mechanism is housed.

Round the upper ends of each of the rods 16 and fixed to the under side of the stationary bars 10 and encircling the spiral springs 24 are the powerful buffer-springs 25. To the lower ends of the buffer-springs 25 are fixed plates 26, which come into contact with the tops of the sliding bars 21 when the latter are raised sufficiently far on the guide-rods 16 to engage them. Between the two sliding bars 21 is arranged the bow 27, which forms the connection with the hauling-rope. This bow, as shown more particularly in Figs. 9 and 10, is shaped at its lower extremities to fit or project beneath the sliding bars 21 and so that it projects along the bars 21 for some distance. It is fixed to the bars 21 at the under side. That part of the bow 27 forming the ledge for the sliding bars 21 is also constructed with a boss 28, which coincides with the central boss 22 for the central guide-rod 16 and with a suitable hole, (not shown,) in which it slides on said rod.

To the shoes 17, between the plates 9 and the top of the skip or cage 1, are fixed plates 30, (see Figs. 1 and 15,) which between them form a vertical slot 31.

Between the two sliding bars 21 are arranged two cylinders 32. The bars 21 are formed with bosses 33 and holes 34, which form bearings for trunnions or pivots 35 on the cylinders 32. (See Fig. 11.) The trunnions 35 may be carried by bands encircling the cylinders 32 at or about the center or be formed on the cylinders, if preferred. In

each of the cylinders is a piston 36. In the periphery of the piston 36 are formed a number of small grooves 37. The piston-rod 38, which is attached to the piston 36, works through a gland 39, fitted in the cylinder-cover 40. The piston-rod 38 is made considerably longer than the cylinder 32 and projects toward the vertical slot 31, formed between the plates 30. The lower extremity of the piston-rod 38 is rounded off or made hemispherical. In the cylinder, between its upper end and the piston 36, is placed a powerful spring 41. The cylinder is also filled with oil or other suitable liquid or gaseous fluid. Communicating with the upper end of the cylinder 32 is a small pipe 42, and communicating with the lower end of the cylinder is another small pipe 43. These two pipes 42 43 are placed in communication by a third pipe 44, and two two-way cocks 45 are interposed between the pipes 42 43.

To the top of the cage 1 at the bottom of the slot 31 is fixed a curved piece of metal 46, which serves as a guide for the lower extremity of the piston-rod 38 and compels it to move toward the guide-rails or runners and at the same time serves to keep the cylinder 32 and piston-rod 38 at the requisite angle or inclination to the guide-rails or runners.

The guide-rails or runners 46[a], which we prefer to employ, are shown in detail in Figs. 12 to 15. They are formed with teeth or projections 47 at suitable distances apart. On the inside these teeth 47 are curved to form the semicircular recesses 48, and along the edges the teeth 47 are rounded off. Between the teeth 47 the guides form recesses 49, which taper inward in a downward direction for a suitable distance and then run vertically to the curved recess 48, formed by the next tooth. It will be obvious that the guides may be made of any other suitable construction. The method of attaching the sections of the guide-rails is shown as consisting of a plate 50, fixed to the abutting ends of the two sections of the rail 46[a] by means of rivets or the like passed through the holes 51, formed in the flanges 52 of the rail and plate 50. In Fig. 15 it is shown how the shoes 17 project to the sides of the guide-rails 46[a] and how the plates 30 at the front of the rails 46[a] form the slots 31, through which the lower extremity of the piston-rod 38 projects to engage the teeth or projections 47 on the guide-rails or runners 46[a].

If for any reason it should not be convenient to locate the safety mechanism at the top of or above the skip or cage 1, it may be arranged at the bottom or beneath the skip or cage and work in a precisely similar manner, the connection between the sliding bars 16 and the hauling-rope or its equivalent being made through the medium of a chain or the like passing through or down the sides of the skip, cage, or the like.

When the safety-gear has been located in the top or over the cage, as shown in the drawings, the operation of attaching the hauling-rope and suspending the cage in the shaft produces the following results: At the outset all the springs 24 25 are fully extended and the two sliding or movable bars 21 are in their lowest positions some distance above the top of the cage. The springs 41 in the two cylinders 32 are also fully extended, and each of the pistons 36 is at the bottom of the cylinder 32 or end of its stroke, and the piston-rod 38 is projected out through the slot 31 toward or in the direction of the guide-rails or runners 46[a], with the end of the piston-rod 38 directed downward. The elastic fluid is above the pistons 36 in the cylinders, and the bow 27 is carried down to its lowest position by the two sliding bars 21. The taking in of the hauling-rope and the suspension thereby of the cage 1 moves the two sliding bars 21 upward in their guideways 20. In the upward movement of the sliding bars 21 the six coiled springs 24 are compressed, the two cylinders 32 are raised, and the piston-rods 38, following the curvature of the guides 46, fall slightly inward, so that they run clear of the guide-rails or runners 46[a]. The sliding bars 21 rise in their guides 20 until they come into contact with the buffer-springs 25, the spiral springs 24 being thereby compressed within said buffer-springs 25. This describes the normal position of the parts as the skip or cage 1 is descending or ascending the shaft suspended by the hauling-rope.

The operation of the safety-gear in the event of a breakage of the rope taking place will be as follows: The bow 27 and two sliding bars 21 being deprived of their support are forced downward by the six coiled springs 24 with a force slightly less than the weight of the empty cage. During this downward movement of the sliding bars 21 the cylinders 32, with the pistons 36 and piston-rods 38, are moved downward, and the lower extremities of the piston-rods 38 are by means of the guides 46 thrown through the slots 31 into engagement with the teeth or projections 47 of the guide-rails or runners 46[a]. After the lower extremities of the piston-rods 38 have engaged one of the recesses 48 on the inside of one of the teeth or projections 47 further movement of the piston-rod 38 is prevented. This causes the six coiled springs 24 to be again compressed, and assuming that the cage is loaded the energy it possesses when it becomes unsuspended is partially absorbed by the six powerful buffer-springs 25 after the six coiled springs 24 have been contracted to a sufficient extent to allow of the contraction of said buffer-springs 25. After the buffer-springs 25 have been compressed the cylinders 32 are forced over the pistons 36 again by the energy of the falling load. This causes the elastic fluid to be

forced through the narrow grooves 37 in the periphery of the piston 36, so that it acts as a powerful cushion against said piston 36 and serves to take up the energy of the load. At the same time the powerful springs 41 in the cylinders 32 are compressed between the pistons 36 and the tops of the cylinders 32. By the time the cylinders 32 have forced the fluid past the pistons 36 and the buffer-springs 41 in the cylinders 32 are compressed the cage has been brought to rest. As the cage falls after the extremities of the piston-rods 38 have engaged the teeth or projections 47 in the guide-rails or runners 46ª the cage passes over the piston-rods 38 by the slots 31, formed at either side of the cage by means of the plates 30. To bring the parts back to their original positions, the two two-way cocks 45 are opened, which allows the elastic fluid when the skip is suspended by the hauling-rope to pass from the bottom to the top of the piston 36. When the piston 36 is again at the bottom of the cylinder 32, the cocks 45 are closed, so that the fluid must pass through the grooves 37 in the piston 36 in the manner previously explained.

What we claim as our invention, and desire to protect by Letters Patent, is—

1. In safety-gear for mine skips cages and the like, the combination with the skip or cage of a cylinder, a piston therein and a piston-rod attached to the piston, and means which operate when the skip or cage becomes unsuspended to place the piston-rods in engagement with teeth, projections or recesses in the guide-rails or runners of the shaft, well or the like, substantially as described.

2. In safety-gear for mine skips cages and the like, in combination, a cage or skip, an oscillating cylinder carried by said cage or skip, a piston arranged in said cylinder, a piston-rod attached to the piston and means which operate when the support for the load is removed to bring said piston-rod into engagement with teeth, projections or recesses in the guide-rails or runners of the shaft, well or the like, substantially as described.

3. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a pair of oscillating cylinders carried by said skip or cage and angularly disposed in relation to the guide-rails or runners, pistons arranged in said cylinders, piston-rods attached to said pistons, and means which operate should the skip or cage become unsuspended in the shaft or well to place the extremities of said piston-rods in engagement with teeth, projections or recesses in the guide-rails or runners of the shaft, well or the like, substantially as described.

4. In safety-gear for mine skips cages or the like, in combination, a skip or cage, a framing carried by said skip or cage, a plurality of vertically-disposed rods arranged in two sets, a horizontally-disposed bar slidably mounted on each set of vertically-disposed guide-rods, springs located on the guide-rods between the sliding bars and a fixed portion of the frame, a pair of oscillating cylinders pivoted between said horizontally-disposed sliding bars, pistons in said cylinders, piston-rods attached to said pistons and means for connecting the hauling-rope to the pair of sliding bars in such manner that should the rope break or the load become unsuspended the springs operate to place the extremities of the piston-rods in engagement with teeth, projections or recesses in the guide-rails or runners of the shaft or well, substantially as described.

5. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a framing carried by said skip or cage, a plurality of vertically-disposed rods arranged in two parallel sets, a horizontally-disposed bar slidably mounted on each set of vertically-disposed rods, a pair of oscillating and angularly-disposed cylinders pivotally carried between the two sliding bars, spiral springs arranged round the guide-rods above the sliding bars and powerful buffer-springs interposed between said bars and a fixed portion of the frame, pistons in the oscillating cylinders, piston-rods attached to said pistons, means for connecting the hauling-rope to the two sliding bars and guides for the extremities of the piston-rods which operate to place the same in engagement with teeth, projections or recesses in the guide-rails or runners should the skip or cage become unsupported in the shaft well or the like, substantially as described.

6. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a framing carried by said skip or cage, a pair of fixed horizontally-disposed parallel bars in the upper end of said frame, a plurality of vertically-disposed rods arranged in two parallel sets, a horizontally-disposed bar slidably mounted on each set of vertically-disposed rods, a spiral and a strong buffer spring on each of said vertically-disposed rods between the sliding bars and the fixed horizontal bars, a pair of oscillating angularly-disposed cylinders pivotally carried between the two sliding bars, pistons in the oscillating cylinders, strong buffer-springs arranged in the cylinders between the pistons and the upper end or cover, piston-rods attached to said pistons, means for connecting the hauling-rope to the pair of sliding bars, guides for the piston-rods which place the outer extremities of same in engagement with teeth, projections or recesses in the guide-rails or runners should the skip or cage become unsupported in the shaft or well, substantially as described.

7. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a pair of sliding bars carried by said skip or cage, a pair of oscillating cylinders pivotally carried

between said bars adapted to be filled with an elastic fluid, spiral springs in said cylinders above the pistons, a piston in each of said cylinders, a piston-rod attached to each piston which projects toward or in the direction of the guide-rails or runners of the shaft or well and are adapted to be brought into engagement with the latter to arrest the movement of the skip or cage, and means which operate to place the extremities of the piston-rods in engagement with teeth, projections or recesses in the guide-rails or runners of the shaft or well should the skip or cage become unsuspended, substantially as described.

8. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a frame carried by said skip or cage, a pair of sliding bars mounted in said frame, guideways formed in the ends of the frame for the extremities of the sliding bars, a pair of oscillating cylinders pivotally carried between said sliding bars adapted to be filled with an elastic fluid, spiral buffer-springs in said cylinders above the pistons, a piston in each of said cylinders, a piston-rod attached to each piston which projects toward or in the direction of the guide-rails or runners of the shaft or well, said frame having slots therein forming guideways for the ends of said piston-rods and a curved guide for each of said piston-rods which guides operate to bring the extremities of said piston-rods in engagement with teeth, projections or recesses in the guide-rails or runners of the shaft or well should the skip or cage become unsuspended, substantially as described.

9. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a framing carried by said skip or cage, a pair of sliding bars carried by said frame, a pair of cylinders pivotally carried between said sliding bars adapted to be filled with an elastic fluid, spiral springs in said cylinders above the pistons, a piston in each of said cylinders, a piston-rod attached to each piston which projects toward or in the direction of the guide-rails or runners of the shaft or well and are adapted to be brought into engagement with the latter to arrest the movement of the skip or cage, shoes fixed to the cage adapted to fit the guide-rails or runners, plates fixed to the shoes which form vertical slots for the extremity of each of the piston-rods and curved guides which direct the ends of the piston-rods into engagement with teeth, projections or recesses in the guide-rails or runners of the shaft or well, substantially as described.

10. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a framing carried by said skip or cage, a pair of sliding bars carried by said frame, plates fixed to the frame which form guideways for the ends of said sliding bars, a pair of cylinders pivotally carried between said bars adapted to be charged with an elastic fluid, spiral buffer-springs in said cylinders above the pistons, a piston in each of said cylinders, a piston-rod attached to each piston which projects toward the guide-rails or runners of the shaft or well and are adapted to be placed in engagement with teeth, projections or recesses in said guide-rails or runners, shoes carried by the skip or cage and frame adapted to fit the guide-rails or runners, plates fixed to the shoes which form vertical slots for the extremities of the piston-rods and curved guides which direct the ends of the piston-rods into engagement with teeth, projections or recesses in the guide-rails or runners of the shaft or well, and means which operate to place the extremities of said piston-rods in engagement with the teeth, projections or recesses in the guide-rails or runners should the skip or cage become unsuspended in the shaft or well, substantially as described.

11. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a frame carried by said skip or cage, a pair of sliding bars mounted in said frame, a pair of oscillating and angularly-disposed cylinders pivotally carried between said sliding bars, pistons in said cylinders and piston-rods attached to said pistons which latter are directed toward the guide-rails or runners and guide-rails or runners having teeth or projections recessed on the inside and rounded at the point and inclined downward in the direction of the next succeeding tooth or projection, substantially as described.

12. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a frame carried by said skip or cage, a pair of sliding bars mounted in said frame, a pair of angularly-disposed cylinders pivotally carried between said sliding bars, adapted to be charged with an elastic fluid, spiral springs arranged in said cy linders between the covers and pistons, piston-rods attached to said pistons, which rods are directed toward the guide-rails or runners in the shaft or well and guide-rails or runners having teeth or projections recessed on the inside to receive the rounded extremities of the piston-rods and rounded at the edge or nose and then inclined inward and downward and then parallel or vertical to the next succeeding tooth or projection, substantially as and for the purposes described.

13. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a frame carried by said skip or cage, a pair of sliding bars mounted in said frame, a pair of angularly-disposed cylinders pivotally carried between said sliding bars adapted to be charged with an elastic fluid, spiral springs in said cylinders between the covers and pistons, a piston in each of said cylinders, a piston-rod attached to each piston which rods

are directed toward the guide-rails or runners in the shaft or well and guide-rails or runners having flanges and vertical ribs or projections at right angles thereto which form the guides for the shoes fixed to the skip or cage and having projections or teeth formed between said vertical ribs or projections recessed on the inside to receive the rounded extremities of the piston-rods and rounded at the edges or noses and then inclined inward and downward and then parallel or vertical to the next succeeding tooth or projection, substantially as and for the purposes described.

14. In safety-gear for mine skips cages and the like, in combination, a skip or cage, a frame fixed to and carried by said skip or cage, two horizontally-disposed bars fixed in the top of said frame having bosses and holes in the under side thereof, sockets carried by the skip or cage, a plurality of vertically-disposed rods arranged in sets between the fixed horizontal bars and the sockets, a horizontally-disposed bar slidably mounted on each set of vertically-disposed rods, a bow connecting said sliding bars and serving as the means for attaching the hauling-rope to the skip or cage, spiral springs and strong buffer-springs arranged between the sliding bars and the fixed horizontal bars which operate to force the sliding bars in a downward direction should the skip or cage become unsuspended in the shaft or well, plates fixed to the frame forming guideways for the ends of said sliding bars, a pair of oscillating angularly-disposed cylinders pivotally carried between the sliding bars adapted to be charged with an elastic fluid, means placing the ends of said cylinders in communication and cocks for opening and closing said communication, buffer-springs arranged in the cylinders between the top and the piston, pistons in said cylinders and piston-rods attached thereto, the latter being directed toward the guide-rails or runners and rounded at their lower extremities and adapted to be brought into engagement with teeth, projections or recesses in said guide-rails or runners, curved guides which serve for directing the ends of the piston-rods into said teeth, projections or recesses, shoes fixed to the skip or cage and plates fixed to the shoes which form a vertical slot for each piston-rod, and guide-rails or runners having teeth projections or recesses which are engaged by the extremities of the piston-rods to arrest the movement of the skip or cage should the latter become unsuspended, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

BRUNO SCHLESINGER.
EDWIN GEORGE WELDON.

Witnesses:
CHAS. OVENDALE,
R. OVENDALE.