No. 632,688. Patented Sept. 12, 1899.

M. ALMA & E. WEISS.

BUFFER.

(Application filed Oct. 4, 1898.)

(No Model.)

3 Sheets—Sheet 1.

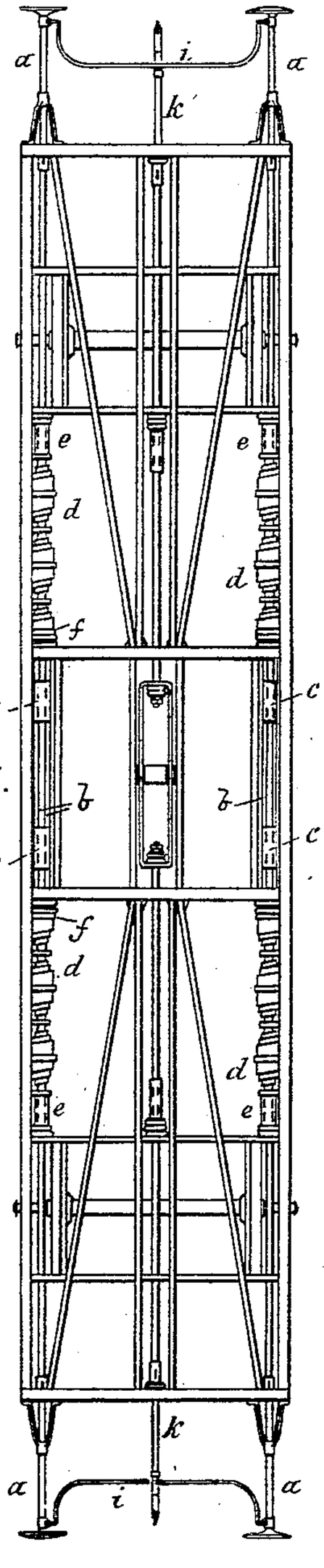

FIG. 1.

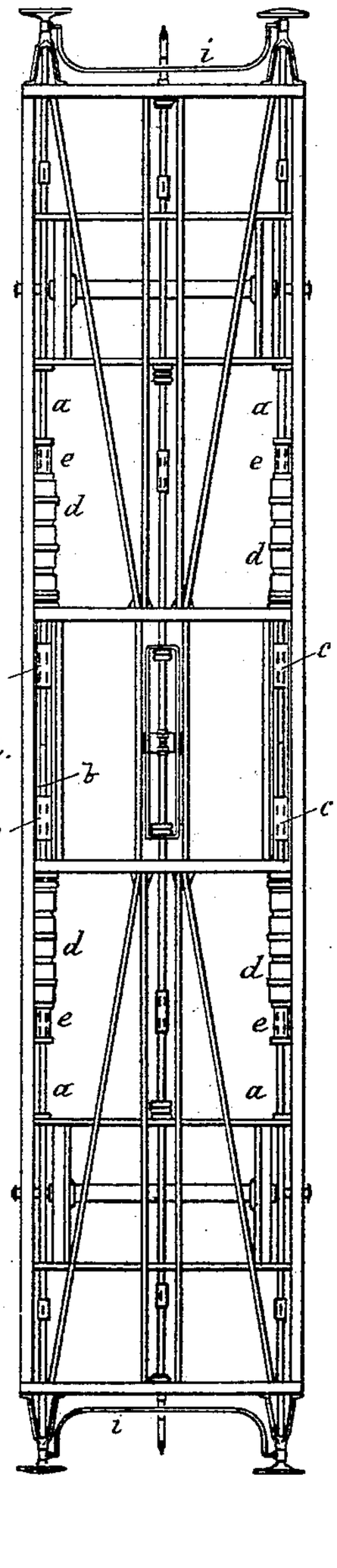

FIG. 2.

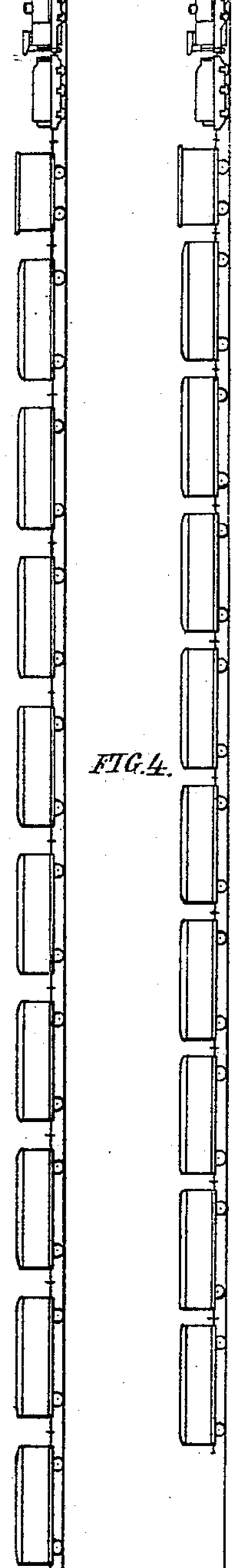

FIG. 3.

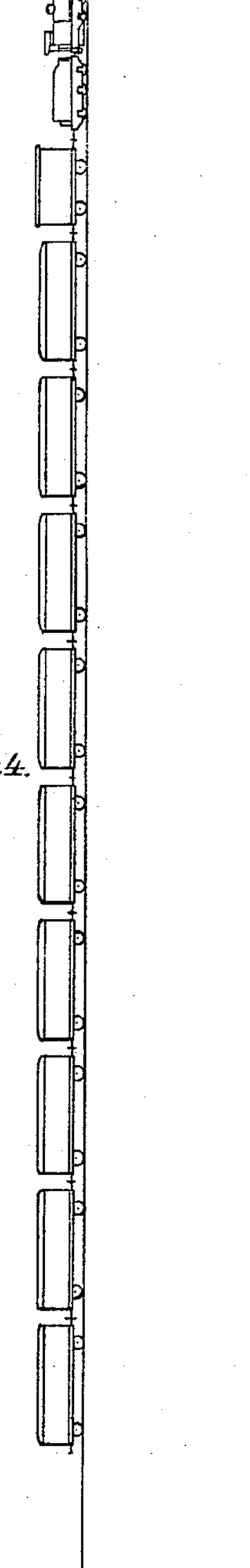

FIG. 4.

Witnesses:
C. Holloway
W. C. Pinckney

Inventors:
Maximilian Alma & Ernest Weiss,
By F. Williamson
Attorney

No. 632,688. Patented Sept. 12, 1899.

M. ALMA & E. WEISS.

BUFFER.

(Application filed Oct. 4, 1898.)

(No Model.) 3 Sheets—Sheet 2.

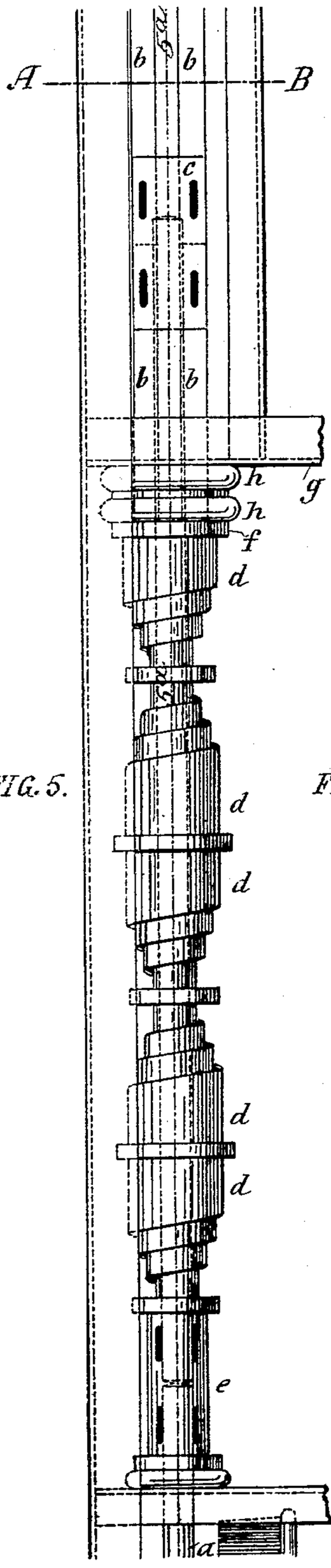

FIG. 5.

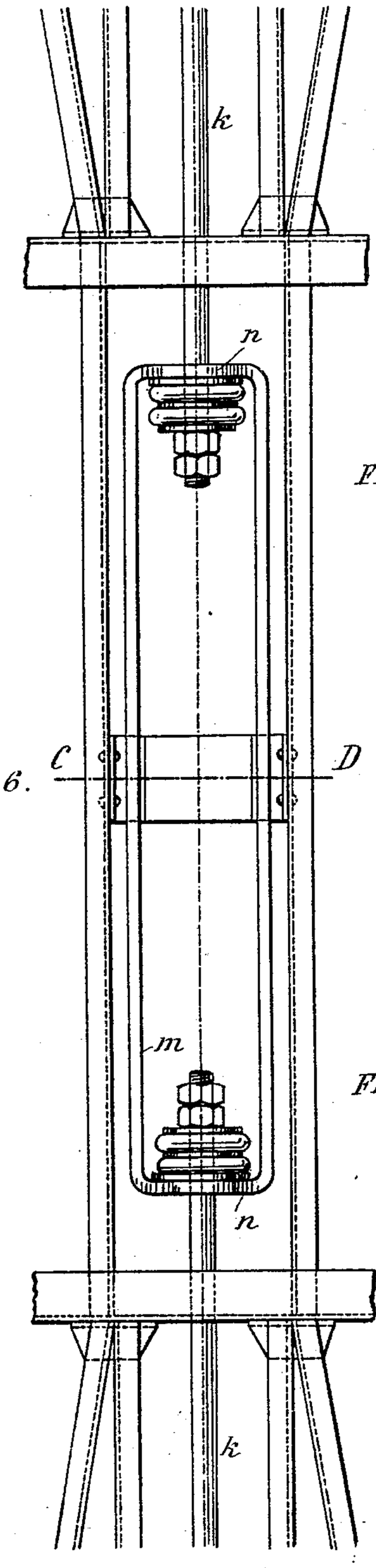

FIG. 6.

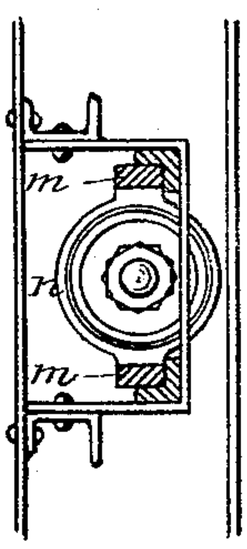

FIG. 8.

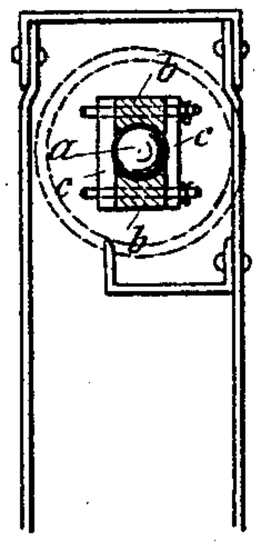

FIG. 7.

Witnesses:
C. Holloway
W. C. Pinckney

Inventors:
Maximilian Alma
Ernest Weiss,
By F. S. Lydon
Attorney

No. 632,688. Patented Sept. 12, 1899.

M. ALMA & E. WEISS.

BUFFER.

(Application filed Oct. 4, 1898.)

(No Model.) 3 Sheets—Sheet 3.

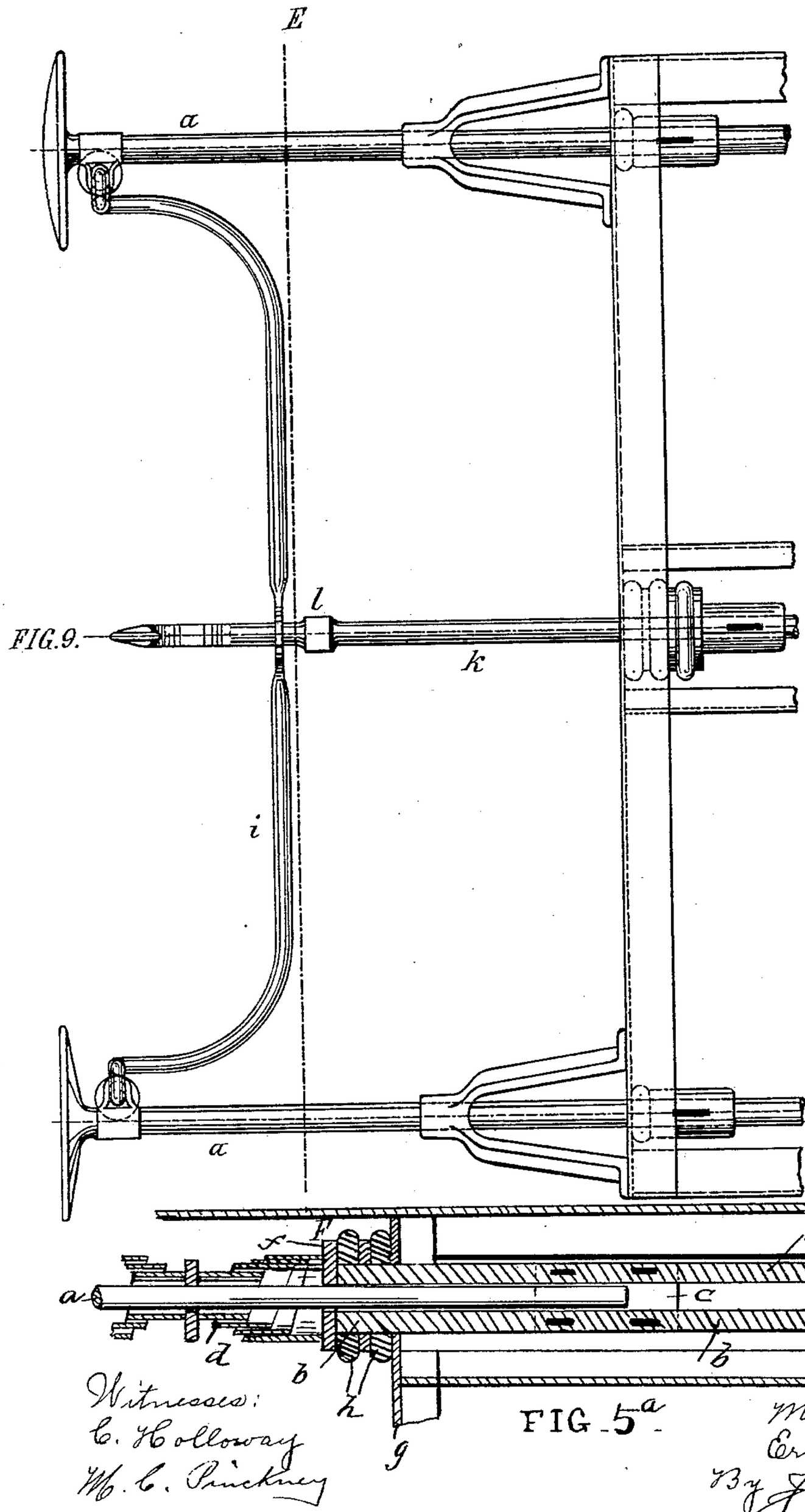

FIG. 9.

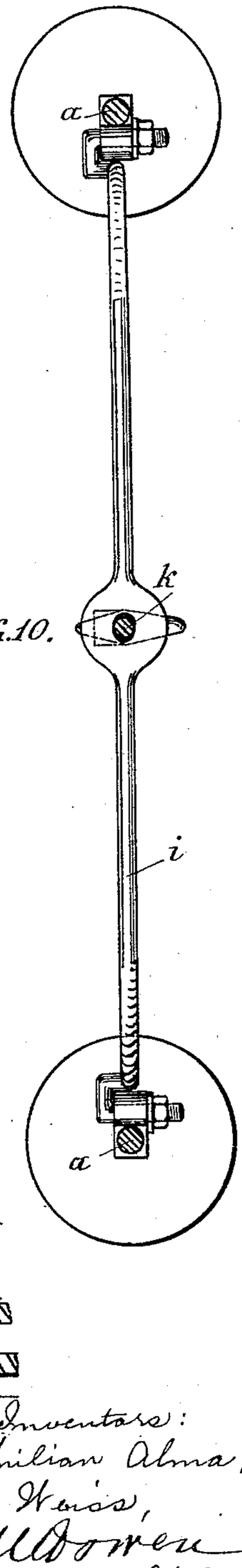

FIG. 10.

FIG. 5a.

Witnesses:
C. Holloway
W. C. Pinckney

Inventors:
Maximilian Alma,
Ernest Weiss,
By F. Hill Dorsey
Attorney

UNITED STATES PATENT OFFICE.

MAXIMILIAN ALMA AND ERNEST WEISS, OF VIENNA, AUSTRIA-HUNGARY.

BUFFER.

SPECIFICATION forming part of Letters Patent No. 632,688, dated September 12, 1899.

Application filed October 4, 1898. Serial No. 692,644. (No model.)

To all whom it may concern:

Be it known that we, MAXIMILIAN ALMA and ERNEST WEISS, of Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Means for Obviating or Minimizing Injury or Loss of Life by Collisions on Railways, of which the following is a specification.

This invention relates to means to be used with railway-vehicles in order to prevent or minimize injury or loss of life from railway-collisions; and it consists in so constructing the buffer arrangements or devices which are to take up or neutralize the impact of colliding carriages, trucks, or the like that they extend right through the under frame of the vehicle; and it further consists in rendering such devices highly resilient by the provision of a system of springs inserted or reaching into the space between the terminal cross-bars or end members of the frame, so that should a collision occur the several carriages shall by forcing their respective buffer or thrust rods inward be still capable of running on for not a considerable distance, such distance being greater in proportion, as the carriage is situated nearer to the rear end of the train; and as the carriages thus continue to travel along for a space their progress is checked, not suddenly but gradually, (though, indeed, in rapid succession,) owing to the progressively-growing resistance met with by the buffer-rod springs. By reason of this circumstance, as well as of the direct and (in consequence of the spring action) elastic mutual operation of the buffer-rods, liability to injury will be minimized or avoided, since by far the greater part of the impact or thrust—*i. e.*, the *vis viva*—is thereby prevented from extending or being transmitted to the under carriages. To this end the buffer-rods of the several carriages which are placed in a line are by the insertion of one or more spring devices made to act upon each other, either by being lengthened, so as to extend back into the carriage parallel to the longitudinal axis of the same, or by being fitted with suitable intermediate mechanism, or both by an extension of their length and the insertion of intermediate apparatus, so that a thrust received by any one of the buffer-plates (or any equivalent terminal device, as a thrust-block or the like) is without the intermediate agency of the carriage-frame communicated to the buffer-rod protruding from the end of the next carriage. Thus all the buffer arrangements extending along the set or train of carriages on either side will in the event of any concussion taking place jointly form one complete resilient structure or system, and may, without subjecting the carriage-frames to any strain, (excepting, of course, that which will arise from friction as the parts slide in their bearings, grooves, eyes, or the like,) be compressed to as full or nearly as full an exent as the resilience of their springs will permit. These springs are so disposed as not to bear or abut directly against any part of the carriage-frame, and both ends of each spring are supported by parts of the buffer mechanism which are movable and therefore capable of altering their relative positions, the said springs keeping such buffer devices apart. When the springs receive a somewhat violent thrust or shock, they will be compressed for a comparatively great distance. To admit of this compression, the said springs are arranged either within the space between the two end members of the carriage or made to project or extend into such space, while the ends of the buffer device on each side of the carriage protrude from the carriage ends for a proportionate distance. The size or thickness of the several component parts of each buffer-rod depends upon the amount of force which they are required to withstand.

The foregoing remarks mainly apply to carriages constructed to take up thrusts by means of two buffer devices, though the arrangements herein described are also applicable to carriages provided either with one or with more than two buffer systems extending through them from end to end.

The invention is applicable not only to carriages drawn by steam-power, but also to vehicles propelled by electricity, including the engines or locomotives in either case.

The invention will be clearly understood by reference to the accompanying drawings, in which one example of its practical application is illustrated, the carriage-frame under consideration being that of a two-axle passenger-carriage.

Figure 1 of the drawings is a plan of an

under carriage provided with the improved safety arrangement according to this invention, the parts being represented in their normal condition—*i. e.*, the buffers being free from pressure. Fig. 2 is a view similar to Fig. 1, showing the buffer rods and springs compressed to their maximum extent. Fig. 3 is a diagrammatic view of a railway-train in motion. Fig. 4 is a similar diagram showing the same train as having encountered an obstacle. Fig. 5 is a plan of part of the spring device and sliding buffer-rod. Fig. 5ª is a section on line 5ª 5ª of Fig. 5. Fig. 6 is a plan of the draw-rod frame in the center of the carriage and of the draw-rod. Fig. 7 is a section on line A B, Fig. 5. Fig. 8 is a section on line C D, Fig. 6. Fig. 9 is a plan of the sliding connection; and Fig. 10 is a section on line E F, Fig. 9.

Like letters refer to identical parts in all the figures.

Each buffer-rod *a* extends toward the center of the length of the car or carriage. The contiguous inner ends of the buffer-rods, which are arranged in a line one with the other and are carried in cheek-pieces *b'*, jointly form what is here termed the "sliding arrangement" or, preferably, "sliding body." The contiguous inner ends of the buffer-rods are in their normal condition at a distance apart equal to about one-tenth of the length of the carriage. The cheeks *b* are connected together above and below by plates *c*, Figs. 1, 2, 5, 5ª, and 7, and can be slightly movable in a direction parallel to the longitudinal axis of the carriage. The sliding arrangement consists of two sliding cheeks *b b*, placed parallel to the longitudinal axis of the carriage and parallel to each other, which may be connected by the plates *c c*, if desired. Between these cheeks are placed the ends of the buffer-rods *a*. These buffer-rods *a* can slide between the cheeks—*i. e.*, they can approach one another—whereby the flanged tube *e*, which is fixed on the buffer-rod, Fig. 1, presses upon the springs *d*, the latter pressing upon the disk *f*. By means of the disk *f* the pressure of the springs *d* is transmitted to the cheeks *b b*, so that the sliding arrangement when acted upon by shocks has to resist pressure in longitudinal direction. From the sliding arrangement the thrust is transmitted by the second disk *f* and the adjoining springs *d* to the other buffer-rod *a*, placed in the same longitudinal line. The sliding arrangement may be firmly connected to the carriage; but it is more advantageous to render the sliding arrangement to some extent capable of moving parallel to the longitudinal axis of the carriage. The drawings show a sliding arrangement of such movability. Fig. 5ª is a horizontal longitudinal section through the sliding arrangement in the height of the axis of the buffer-rods, showing one-half of the sliding arrangement, with the adjoining disk *f*. G H indicate the cross-center line of the carriage. The members *b* extend from one disk *f* to the other, Fig. 1, through openings in cross-beams *g* and abut against said disks *f*. These disks are perforated in the center to such extent only as to allow of the buffer-rods *a* being movably placed through them. (Only one-half of the sliding arrangement, and therefore only one disk *f*, is shown in Fig. 5ª, these parts being alike at both ends.)

The frame of the truck is protected from shocks by the yielding rings *h*. When one of the rods *a* is pressed in and rod *a* at the other end of the car is not pressed in, or is pressed in with less force than the other, parts *b* are slid or moved longitudinally toward the rod *a* pressed inward the least, (by compression of rings *h* or of spiral springs which may be provided in place of these rings,) and the members *b* thereby compress the springs on the other end of the truck. The sliding arrangement *b b* thus has but a limited movement, its movability depending upon the compressibility of the rings *h* or of the spiral springs which may be provided in place of the rings.

The buffer-rods *a*, which will be herein described by the more general term of "thrust-rods," are in the present arrangement adapted to slide only over a small surface, for which purpose each thrust-rod is made thicker at one part than at the remaining parts, or the inner faces of the sliding cheeks are so formed as to be in contact with the thrust-rods to a limited extent. The distance which each thrust-rod may be pressed into the sliding arrangement by the compression of the springs equals about one-twentieth of the length of the carriage. The system or set of the springs *d*, Figs. 1, 2, and 5, with which each thrust-rod is fitted, abuts at one end against a flanged tube *e*, Figs. 1, 2, and 5, which forms a coupling for connecting the thrust-rod and spring, while the other end of each set of springs presses upon a plate or disk *f*, Figs. 5 and 5ª, situated immediately in front of the sliding cheeks *b*—*i. e.*, between the spring and member *b*. Between this disk *f* and the bridge *g* of the frame there are interposed india-rubber rings *h h*, which surround the sliding arrangement. By means of this arrangement of springs shocks or thrusts imparted to the buffer-plate are first transmitted to the sliding arrangement and thence to the springs of the next thrust-rod in line therewith of the same carriage, and as this last-mentioned thrust-rod in its turn is in contact with the corresponding thrust-rod of the adjoining carriage the thrust devices of all the carriages neutralize the effect of thrusts of considerable power. Immediately behind the buffer-plates the thrust-rods are connected by a cross-piece *i*, forming what is herein termed the "sliding" connection and having for its object to permit either one of the thrust devices to move within predetermined limits independently of the other thrust device, which is parallel to it.

The draw-rod K is passed through this sliding connection and is provided with an enlargement *l*, Fig. 9, against which when the thrust-rods *a* are pushed back the sliding connection *i* comes into contact, causing the draw-rod *k* to move along with them. When the springs *d* of the thrust-rods expand, the draw-rod will move outward again under the pressure exercised by the sliding connection upon the obstacle formed by the draw-hook or any other equivalent object.

The draw mechanism consists of at least three parts, so arranged that the outward movement of two outer parts is limited; but they can be pressed closer together and then move back again to their initial positions. The draw mechanism illustrated by Figs. 6 and 8 of the drawings consists of three parts, the central part *m*, Fig. 6, having end plates or disks *n*, and the draw-rods K, which are adapted to slide in the end plates *n*. This central part, which for convenience is called the "draw-rod frame," is arranged in the center of the carriage, and through the ends or disks *n* the draw-rods *k* pass. On the ends of the draw-rods at the rear of disk are nuts or other projections. Between the nuts or other projections on the end of the rod and the corresponding disk *n* are interposed india-rubber rings or washers to insure a yielding tractive strain. Similar arrangements are also provided on the draw-rod behind the end member of the frame; but the india-rubber rings placed here are somewhat more compressible than those before described. As the initial pull is exercised upon the draw-hook the strain to which one end of the draw-rod is thereby subjected is communicated to the entire draw mechanism and thence, through carriage-coupling, to the draw-rod of the next carriage, and so on, so that the tractive effect produced from one end of the train to the other is not interfered with by the fact that the draw-rods are divided.

The main longitudinal members of the carriage-frame are arranged with their bridge extending to outside, and the cross-bars situated at or near the center of the carriage are of the same dimensions transversely as the said main longitudinal members, and the sliding mechanism is made to extend through them.

It will be readily understood that when a collision occurs the individual carriages will be capable of traveling for a not inconsiderable distance farther owing to the arrangement of the thrust-rods, which slide inward, such distance being greater as the carriage is situated farther rearward, and the further progress of the carriages is checked, not suddenly, but gradually, owing to the springs which the thrust-rods compress in their residing movements, this being effected by the progressively-growing resistance and the direct but yielding spring action of the thrust-rods, whereby injury and loss of life as a result of collisions are minimized.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, we declare that what we claim is—

1. The combination of a car, having end and intermediate cross-beams, thrust-rods in line with each other, projecting from the ends of the car, the inner ends of the rods being separated by some distance, couplings to which said thrust-rods are connected so as to move said couplings inwardly, sets of springs on each thrust-rod, one end of each set of springs bearing against one of said couplings, a member between said springs and adapted to transmit pressure from one set of springs to another and supported by the intermediate cross-beams, disks *f* between the springs and the intermediate member, and compressible devices *h* between disks *f* and the cross-beams.

2. The combination of a car, thrust-rods in line with each other, projecting from the ends of the car, the inner ends of the rods being separated by some distance, couplings to which said thrust-rods are connected so as to move said couplings inwardly, sets of springs on each thrust-rod, one end of each set of springs bearing against one of said couplings, a member between said springs and adapted to transmit pressure from one set of springs to another, the contiguous ends of the springs thrusting against said intermediate member, said thrust-rods also extending through their springs and into the intermediate member.

3. The combination of a car, thrust-rods in line with each other on each side of the car, projecting from the ends of the car, the inner ends of the rods being separated by some distance, couplings to which said thrust-rods are connected so as to move said couplings inwardly, sets of springs on each thrust-rod, one end of each set of springs bearing against one of said couplings, a member between said springs and adapted to transmit pressure from one set of springs to another, the contiguous ends of the springs thrusting against said intermediate member, draw-rods supported so as to be movable inwardly independently but pulling against each other during traction, and a cross-bar *i* connecting the thrust-rods and draw-rods.

In witness whereof we have hereunto signed our names, this 21st day of September, 1898, in the presence of two subscribing witnesses.

MAXIMILIAN ALMA.
ERNEST WEISS.

Witnesses:
HENRY C. CARPENTER,
JOHN LUX.