No. 612,096. PATENTED FEB. 6, 1906.

G. L. SOUTHARD.

RAILROAD TANK CAR.

APPLICATION FILED MAR. 27, 1905.

2 SHEETS—SHEET 1.

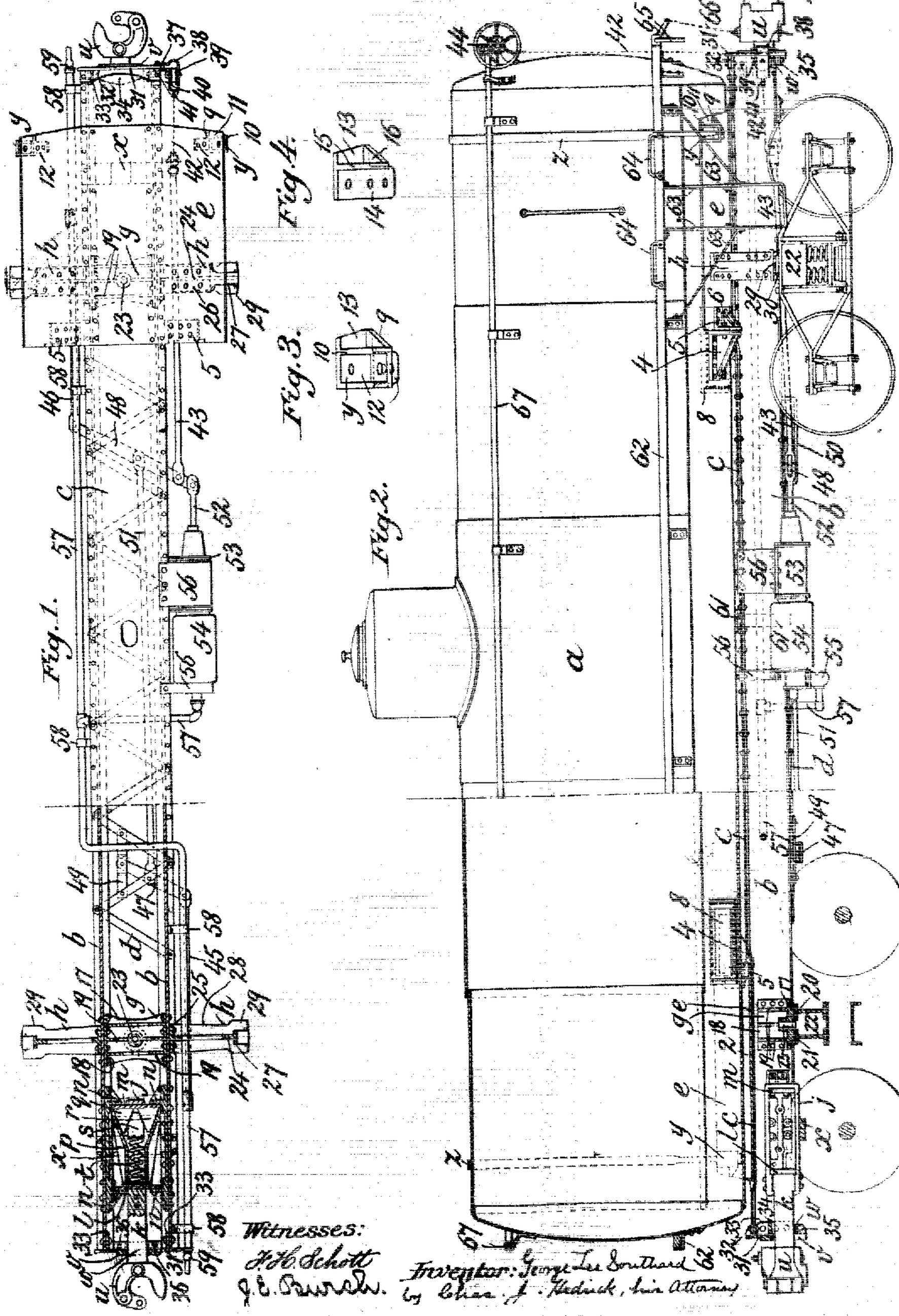

Fig. 1.

Fig. 2.

Fig. 3.

Witnesses:
H. H. Schott
P. E. Burden.

Inventor: George Lee Southard
by Chas. J. Fiedler, his Attorney

No. 812,096. PATENTED FEB. 6, 1906.

G. L. SOUTHARD.

RAILROAD TANK CAR.

APPLICATION FILED MAR. 27, 1905.

2 SHEETS—SHEET 2.

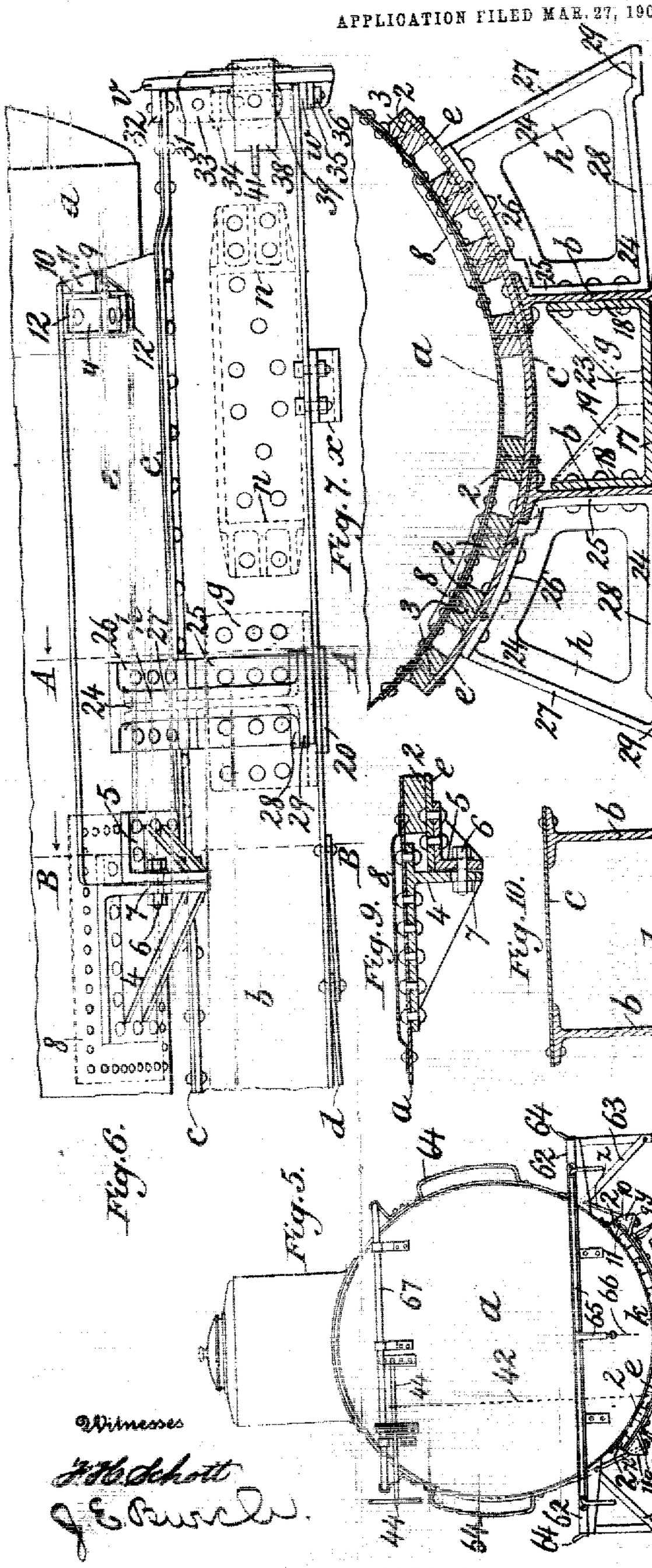

Fig. 6.

Fig. 7.

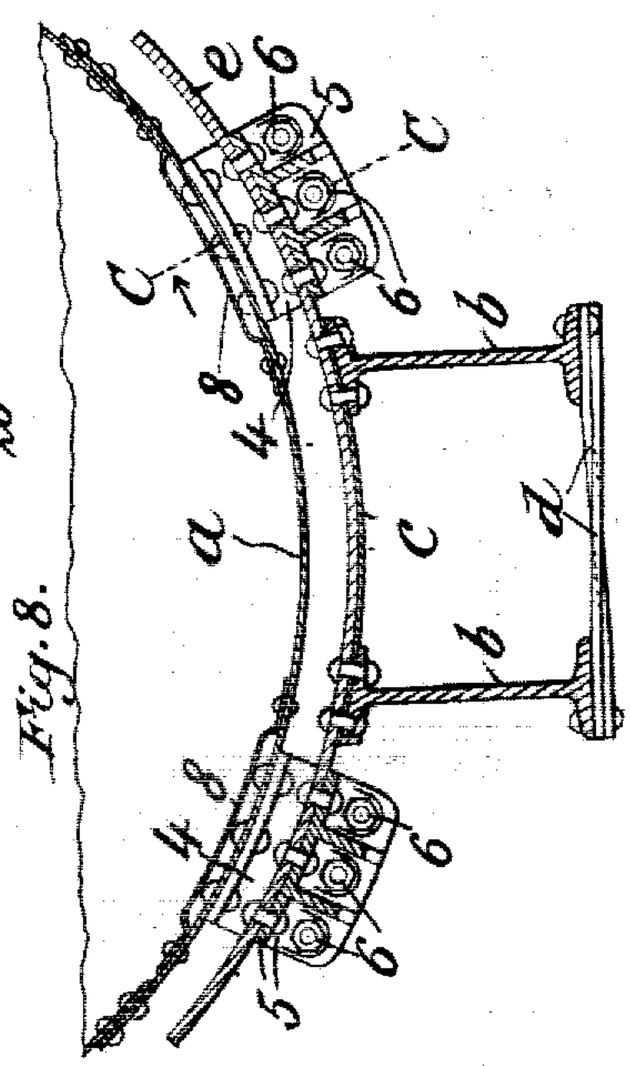

Fig. 8.

Fig. 9.

Fig. 10.

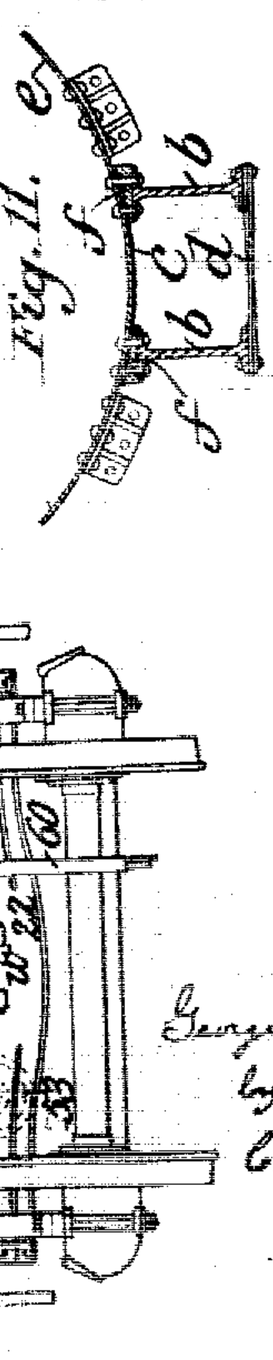

Fig. 11.

Fig. 12.

Fig. 5.

Witnesses

F. H. Abbott

J. E. Burch.

Inventor

George Lee Southard

by

Chas. J. Hedrick

his Attorney

UNITED STATES PATENT OFFICE.

GEORGE LEE SOUTHARD, OF SOUTHARD, OKLAHOMA TERRITORY, ASSIGNOR TO UNION TANK LINE COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

RAILROAD TANK-CAR.

No. 812,096. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed March 27, 1905. Serial No. 252,366.

To all whom it may concern:

Be it known that I, GEORGE LEE SOUTHARD, a citizen of the United States, residing at Southard, in the county of Blaine and Territory of Oklahoma, have invented new and useful Improvements in Railroad Tank-Cars, of which the following is a specification.

This invention relates more particularly to tank-cars for the transportation on railroads of oil and other liquids; but each of the improvements composing the same is intended to be secured for all the uses to which it can be applied with or without modification.

First. Railroad tank-cars are subjected in use to severe stresses of buffing and pulling, more particularly of buffing, and much attention has been devoted to the construction of the cars of sufficient strength to resist such stresses, while minimizing the weight. It is also very important to minimize the amount of repairs. It is further a matter of importance to utilize the tanks of cars which for one reason or another have failed and whose tanks may be lighter than they would now be made. The ordinary railroad tank-car consists, in addition to the wheeled trucks, of, first, an underframe which constitutes, in effect, a platform-car, and, second, a tank which rests thereon and is held from independent motion longitudinally, transversely, and rotatively. In this type of car the stresses are transmitted between the buffing and pulling appliances at the respective ends of the car mainly or wholly by the underframe. In another and recent type of car the buffing and pulling appliances are secured to the tank itself in such manner that the stresses are transmitted thereby. This construction enables an underframe to be dispensed with. Tank-cars have also been made or proposed in which the tank is secured to the underframe in such manner that it assists to a certain extent in a practically constant ratio in the transmission of stresses. In this type, as in the two former types, there is no distinction in the transmission between buffing and pulling or between lesser and greater stresses. All are transmitted alike, or practically so. In accordance with the present invention the tank and a parallel stress-transmitting member, which is best in the form of an underframe, are both of them connected with the buffing and pulling appliances in such manner that at least one and most advantageously both of them serve for the transmission of pulling and both of them for the transmission of buffing stresses; but while there is best a constant and uniform connection of both stress-transmitting members—namely, the tank and the parallel member—with the buffing and pulling appliances for transmission of pulling stresses there is introduced into the tank connections with respect to buffing stresses a looseness which does not exist in those of the parallel member and which is taken up when a certain degree of buffing stress is attained. Thus there may be and most advantageously is a distinction between the transmission of buffing and pulling stresses, respectively, and there is a distinction between the transmissions of buffing stresses of lower and higher degree, respectively. The heavier buffing stresses are borne by the tank in larger ratio than the lighter buffing stresses are. The tank can be relieved of lesser shocks, whose repetitions, notwithstanding their smallness, tend to loosen the tank-rivets and which a parallel member of moderate weight can resist, while at the same time the strength of the tank can be utilized in resisting greater shocks, which are apt to be of less frequent occurrence. The resistance to be overcome and the extent of movement required to take up the looseness in the buffing connection of the tank can be varied; but it is considered an advantage and special improvement to make the resistance large, such as would be required, for example, to shorten the parallel member by deflection under compression, and the movement small, such as would be within the limit of elasticity of a so-shortened member. By providing both the stress-transmitting members with constant and uniform connections with respect to pulling stresses between said members and the buffing and pulling appliances freedom of motion is lessened in a manner which need not interfere with the above-mentioned looseness in the tank connections with respect to buffing stresses. It is considered a further advantage and special improvement to make the pulling connections of the tank adjustable, so that they can the more easily be made and kept tight. Longitudinally-adjustable tank connections are, moreover, believed to be new with or without

the limited loose connections for the tank with respect to buffing stresses and are so intended to be secured hereby. An additional improvement consists in interconnecting the two stress-transmitting members in such manner that longitudinal motion of one independent of the other is prevented, except as such motion may be required in taking up the before-mentioned looseness in the buffing connections of the tank. Such interconnection can best be made through the beforementioned pulling connections of the tank; but it need not be thus constituted, and it is intended to be secured with or without pulling connections for the tank. In the cars used on American railroads the buffing and pulling appliances are commonly united as a draft-rigging with housing and draw-bar with or without buffer-plate behind the coupler-head, and similarly-united appliances are primarily intended in this specification under the expression "buffing and pulling appliances;" but this expression is also intended by extension to include in general any suitable form of appliances for these purposes, whether the pulling and buffing are or are not performed in whole or in part by the same devices.

Second. For repairing tank-cars it is desirable that the tanks should be removable from the body-bolsters and the buffing and pulling appliances as well as from the parallel stress-transmitting members when these are employed. Heretofore, so far as I am aware, in cars which dispense with such members the tanks have not been removable; but they are permanently attached to the body-bolsters and the buffing and pulling appliances. In cars which have such members and utilize the tanks also as stress-transmitting members the tanks have been permanently attached, directly or indirectly, to the body-bolsters and the buffing and pulling appliances as well as to the parallel stress-transmitting member. In cars of the ordinary type the tanks have been removable; but the removably-attaching means employed therein have merely held the tanks in place on the underframe. In accordance with the present invention the tank is removably attached directly or indirectly to the body-bolsters and the buffing and pulling appliances as well as to the parallel stress-transmitting member (when employed as best it would be) by means which enable the tank to uphold the buffing and pulling appliances and to transmit the buffing and pulling stresses from or to said appliances. Thus even without a parallel stress-transmitting member the car could travel if the tank should be in place or with such parallel member in place the car could travel without a tank.

Third. For carrying into effect the hereinbefore-mentioned new features much latitude of construction and arrangement is permissible; but in order to carry them out in what is considered the best way certain constructions and arrangements have been adopted which are believed to be new and are accordingly included in the invention as special improvements. Moreover, they, or some of them at least, are believed to exhibit novelty, irrespective of their use for carrying out the hereinabove-mentioned new features and irrespective also of their embodiment in forms adapted to such use. The description of them can best be given in connection with the accompanying drawings.

The drawings illustrate what is considered the best mode of carrying the invention into effect, and it will be understood that additions, omissions, and modifications can be made indefinitely so long as the substance of any one or more of the hereinafter-written claims is taken.

Figure 1 is a view, partly in plan and partly in horizontal section, of the underframe of a railroad tank-car in accordance with the invention, the tank and the wheeled trucks being removed and the brake mechanism carried by the underframe being shown. Fig. 2 is a view, partly in side elevation and partly in vertical longitudinal section, of said car. Figs. 3 and 4 are detail views showing modified forms (within the invention) of one of the push-pockets of said car. Fig. 5 is an end view of the car, (draw-bar in section.) Fig. 6 is a view in side elevation of the underframe and tank at one end of the car. Figs. 7 and 8 are cross-sections on lines A A and B B, respectively, Fig. 6, looking in the direction of the arrows. Fig. 9 is a detail view on line C C, Fig. 8, looking in the direction of the arrow. Fig. 10 is a view of the underframe in cross-section at the middle of the car, and Figs. 11 and 12 are views similar to Fig. 8 of modified arrangements within the invention.

As shown, below the tank *a* there is an underframe which forms a stress-transmitting member parallel with the tank *a* and which is composed of cross-connected longitudinal sills *b* of flanged metal—namely, channel-beams in Fig. 12 and I-beams in preceding figures. The cross connection shown consists of a top plate *c*, riveted to the top flanges of the sills, and lattice-bars *d*, riveted to their bottom flanges. In addition to the cross-connected sills the underframe also includes a saddle-plate *e* at each end of the car. The saddle-plate is riveted to the top flanges of the longitudinal sills, which are best swaged into an oblique position, Figs. 6, 7, 8, and 12, under the saddle-plates and left horizontal between the trucks, Fig. 10. The top flanges can, however, be left horizontal throughout, wedge-shaped filling-pieces *f* being interposed, Fig. 11, below the saddle-plate. In either way each saddle-plate is provided with seats conforming with its curvature. The top plate *c* is best continued under the saddle-

plate, being swaged in its underlying portions to conform with said saddle-plate.

The sills *b* are shown as extending beyond the body-bolsters, which are each composed, as shown, of a center bearing-block *g* and two outboard bearing-arms *h*, riveted together with the webs of sills *b* interposed, Figs. 1 and 7, and between the body-bolsters and the sill ends are located the draft-rigging of any preferred description. That shown, Fig. 1, is of the "friction" type, as it is called.

The strap *j* of the draw-bar *k* encircles the followers *l* and *m*, whose respective movements are restrained in one direction by the corresponding projections *n* of castings riveted to the webs of sills *b*. Between the followers is a casing *p*, which is sufficiently shorter than the space between the followers when each of them is against its projection *n* to allow the desired amount of motion. Inside the casing *p* are three wedges *q r s* and a spring *t*, and the inner faces of the side walls of casing *p* opposite the wedges are correspondingly inclined.

The effect of both buffing and pulling stresses applied to the draw-bar *k* is to bring the followers *l m* closer together. Under buffing stress the follower *l* is pushed back, while the follower *m* is held stationary. Under pulling stress the follower *m* is drawn forward, while follower *l* is held stationary. In either way the followers approach each other and the wedges *q r* are forced into the casing *p*, whose obliquely-disposed side walls force them toward each other. Both the longitudinal and the lateral motions of wedges *q r* are communicated to the wedge *s*, with consequent compression of the spring *t*. The outward movement of the draw-bar is arrested by contact with each other of follower *m* and casing *p*. Its inward movement can be arrested similarly or the back of the coupler-head *u* can make contact with a buffing-plate constituted by the nose-piece *v* on the end of the sills *b*. The cross-pieces *w* and *x* uphold the draw-bar and draft-rigging.

The saddle-plates *e* each overlie the sills *b* and through them are attached to the corresponding body-bolsters and buffing and pulling appliances. This is desirable for one reason—in order to strengthen the projecting ends of the sills. Greater strength (at least against buffing stress) is needed here than in the middle portion of the underframe for one reason, because at such middle portion the heavier buffing stresses would, as shown, be borne jointly by the tank and the underframe acting as parallel struts. Another reason for having the saddle-plates extend beyond what may be called the "bolster" regions is to bring the retaining-brackets *y* nearer the car ends. The brackets *y* are riveted to the saddle-plates and receive the ends of tank-bands *z*, Figs. 2 and 5. These ends are screw-threaded. Each of them passes through a hole in a bracket and is held by a nut.

The extension of the saddle plates along with its connection by tank-bands *z* with the tank brings the ends of the tank into action as supporting-cantalivers for the buffing and pulling appliances, giving greater stability against downward components of buffing stresses and in connection with the strength of the saddle-plate lessening or avoiding danger of bending or breaking the sills *b* near the body-bolsters.

The tank *a* rests at the ends in the hollow upper surfaces of the saddle-plates best with the interposition of bed-planks 2, which may be secured by bolts 3, Fig. 7, to the saddle-plates. These planks are advantageous for one reason, because they can be shaped to accommodate a tank of whatever diameter it may within limits of course be desired to employ. Thus saddle-plates of the same diameter may serve satisfactorily with tanks of different diameters, and tanks of different diameters can be used at different times on the same underframe.

In order to hold the tank on the underframe, it must be restrained from longitudinal, transverse, and rotary movements independent of the underframe, except as a limited movement in one or other of these ways may be permissible. The curved shape of the saddle-plates *e* holds it from horizontal movement, and the tank-bands *z* restrain its vertical movement, and by their joint action all transverse motion is prevented. Devices 4, secured to the tank and engaging appropriately-disposed parts of the underframe, restrain its longitudinal and rotary motions.

As shown, the devices 4 are in the form of angle-pieces with large curved bases which are riveted, preferably by one-inch rivets, to the cylindrical or body portion of the tank-shell laterally beyond the sills *b*, Fig. 8, and longitudinally behind the saddle-plates *e*, Figs. 6 and 9. On the saddle-plates opposite each of the devices 4 is a device 5, which is shown in the form of an angle-piece with curved base riveted, preferably by inch rivets, to the saddle-plate. Bolts 6, inserted through holes in the devices 4 and 5, bring those of each pair into engagement with respect to both longitudinal and rotary motion. They constitute adjustable longitudinal connections which restrain the tank from longitudinal motion independent of the underframe, and by projecting from one device into its companion they restrain its independent rotary motion. It is preferred for the bolt-holes in the devices 4 to be elongated, Fig. 9, in order to facilitate the adjustment of the tank on the bed-plank 2.

By taking out the bolts 6 and releasing the tank-bands *z* the tank *a* is free to be lifted from the underframe. By restoring the tank and restoring and tightening the said bolts

and tank-bands the car is ready for service. It facilitates placing of the tank in position to have the devices 4 on each side of the car so placed as to leave free spaces between them and the opposing parts when the tank is in place. The adjustability of the bolts 6 (by screwing up their nuts) enables tight connections to be made. As a further means for facilitating the placing of the tank in position the faces of devices 4 are sloped at their lower part, as shown at 7, Figs. 6 and 9, their upper parts being vertical. The free spaces between devices 4 and opposing parts allow the tank to expand when steamed out or when its contents are heated.

As thus far described, the pulling stresses are transmitted from the buffing and pulling appliances at one end of the car to those at the other through the cross-connected sills *b*, as a tie member parallel with the tank, and also to a certain extent through the tank *a* in consequence of the tight connection of the tank with said appliances by means of the bolts 6 and saddle-plates *e*. With free spaces between the devices 4 and the opposing parts of the underframe—namely, the edges of the saddle-plates *e* and the faces of devices 5—the buffing stresses will be transmitted wholly through the cross-connected sills *b* as a strut member parallel with the tank. The tank *a* will, however, itself be brought into action as a strut member to transmit buffing stresses by contact of the devices 4 with said opposing parts. While such contact exists, the buffing stress will cause pressure of said parts against the devices 4 at one end of the tank, and this pressure will be transmitted by the latter to the devices 4 at the other end of the cars and be communicated by the latter devices 4 to the corresponding saddle-plate *e*. To utilize the tank *a*, therefore, constantly as a transmitter of buffing stress, it is only necessary that there should be constant contact of the devices 4 with the opposing parts of the underframe, and to relieve it of such stress it is only necessary to avoid such contact. It is important, however, to relieve the tank of lesser shocks while bringing it into action to help sustain the greater ones. As shown, therefore, a looseness is introduced into the tank connections with respect to buffing stresses by having a certain space between each device 4 and the opposing parts of the underframe; but this looseness is limited, so that it can be taken up when a certain degree of buffing stress is attained. Thus the spaces between devices 4 and the opposing parts are so small that a corresponding shortening of the sills *b* can take place without breakage or permanent deformation. When the buffing stress becomes great enough to shorten (by deflection) the sills to this extent, there is a tight buffing connection between the two ends of the car by way of the tank *a*, as well as by way of the sills *b*, which continue to act as a parallel stress-transmitting member. The ratio in which the tank *a* transmits buffing stresses varies from zero (before contact) to a material proportion (after contact.) What the final proportion will be depends upon the resistance which the sills *b* may oppose to shortening. The less their resistance the larger the proportion of the buffing stresses which the tank *a* will have to support after contact.

In order that the devices 4 may best resist the pressure put upon them, this is brought to bear upon them as near to the tank *a* as practicable, and the bases of said devices are extended beyond the contact-faces, as shown in Fig. 9, so that said bases to a certain extent overlap the saddle-plates *e*.

It is considered best to have about one-sixteenth of an inch space between each device 4 and those portions of saddle *e* and device 5 with which it makes contact. This would require the underframe to be shortened about an eighth of an inch before contact. The space should be large enough to relieve the tank of the lesser shocks and not so large as to involve breakage or permanent deformation of the under frame in order to bring the tank into action as a stress-transmitting member. The underframe may consist of two twelve-inch I-beams, forty pounds to the running foot, covered with a top plate of half-inch thickness. These figures and any others herein set forth are given only by way of example. It is preferred to have the space (given above as about one-eighth inch) divided about equally between the two ends of the car, but it may be divided in any ratio. It could be all at one end of the car. In such case the devices 4 at this end of the car would be drawn close up against the opposing parts, and the tank would be held thereby from longitudinal motion independent of the underframe, irrespective of the devices 4 and 5 and bolts 6 at the other end of the car. When the devices 4 are in contact with the opposing parts, they hold the tank from independent longitudinal motion. Were the bolts 6 to break, the devices 4 would by contact with the cross-connected sills *b* restrain the rotary and to some extent the transverse motion also of the tank *a*.

Should the underframe between trucks be broken or cut out, the tank *a* would still remain attached to the saddle-plates, and consequently could travel. The bolts 6 should in such case be tightened at both ends of the car. The buffing and pulling appliances would be supported by the tank, which would transmit all the stresses of buffing and pulling. At the same time the tank would be readily removable from said appliances and from the body-bolsters by loosening the tank-bands *z* and loosening and removing the bolts 6.

In order to guard against the tank leaking

if an opening should occur in the areas of fastening the devices 4 thereto, a tight cover-plate 8 is secured inside the tank over each of said areas. A line of rivets secures the margin of each cover-plate, and the latter is calked at the edges.

The brackets *y* for the tank-bands are each provided with a ledge 9, Figs. 1, 5, and 6, which in connection with the flange 10 of the bracket and the portion 11 of the saddle-plate constitutes a push-pocket. Ordinarily the push-pockets have angle-pieces as bases, by which they are secured to the corners of end sills. Such sills are not employed in the car shown, and the ordinary pockets therefore cannot be used. By providing the saddle-plates *e*, which extend beyond the bolster regions, and placing the brackets *y* at the ends of the saddle-plates (which positions are desirable for effectively utilizing the tank ends as supporting-cantalivers for the buffing and pulling appliances) said brackets *y* are brought into positions where push-pockets could appropriately be placed. By providing said brackets with the ledges 9 they perform a double purpose—namely, first, as tank-band brackets, and, second, as parts of push-pockets. The curved base 12 of each bracket forms a curved base for the push-pocket by which it can be riveted to the saddle-plate, and the flange 10 a side wall of the push-pocket. As shown in Figs. 2, 5, and 6, the back of the push-pocket is formed by the saddle-plate; but a permanent back 13, Fig. 3, could be provided. A push-pocket with curved base 14, side 15, and bottom 16 could be made separate from a tank-band bracket, as shown in Fig. 4. The saddle-plate could form the back, as in Figs. 1, 5, and 6, or there could be a permanent back 13, as in Fig. 3.

The center bearing-blocks *g* are best composed, Figs. 1, 2, and 7, each of a horizontal plate 17 and upright sides 18 with transverse vertical webs 19, the top being left open.

At 20 is the usual circular disk, which fits in the customary corresponding cup 21 on the truck-bolster 22, Fig. 2, and at 23 is the boss in which is the hole for the king-pin.

The transverse webs 19 are best made to diminish in height toward the center, Fig. 7. The construction shown of the block *g* is believed to have points of novelty with or without the disk 20. It combines lightness and strength, the metal being disposed where resistance is needed in the middle portion of a body-bolster.

The outboard bearing-arms *h* are best made four-sided with vertical webs 24 cut away in the middle and flanged around the four edges, the flanges 25 and 26 by which the arm is attached to one of the sills *b* and to the saddle-plate being wider than flanges 27 at the outer edge of the arm. The bottom 28 of each arm is offset near its outer end, leaving the side bearing 29 to make contact with the side bearing 30 of the truck-bolster when necessary. Such an arm is light, strong, and in one piece.

The nose-piece *v* at each end of the car is best composed of a face-plate 31, which is cut out from below to receive the draw-bar *k*, Fig. 5, and is made of greater thickness around the opening and which is provided with a horizontal flange 32, Figs. 1, 2, and 6, and vertical flanges 33 for attachment (by riveting) to the sills *b* and also with horizontal strengthening-web 34 between the vertical flanges 33. To enable it to uphold the draw-bar-supporting cross-piece *w*, it is provided with lugs 35 on opposite sides of the central opening. The cross-piece *w* overlies the lugs and is secured thereto by bolts 36, Figs. 1 and 6. The weight of the draw-bar is therefore supported by the lugs and not by the bolts. These merely hold the cross-piece in place. On releasing and removing the cross-piece *w* and also the cross-piece *x* the draw-bar and draft-rigging will drop out. They can be returned readily in reverse manner.

The nose-piece *v* is provided with an extension 37 (right end of Fig. 1) beyond the corresponding sill *b* sufficient to form a support for the bracket 38 of the brake-chain pulley 39. This bracket is composed of a strip bent into an oblong form (right end of Fig. 1) with strengthening-web 40. The ends of the strip are lapped on and riveted to the extension 37 of the nose-piece, Figs. 1, 2, 5, and 6.

At 41 is a lug for attachment of the stationary end of the brake-chain 42. This chain is reeved around the pulley on the end of brake-rod 43, runs over the pulley 39 in bracket 38, and has its other end wrapped on the axle of brake-wheel 44, which is mounted, as not unusual, on the end of the tank. The brake-rods 45 and 46 for operating the live brake-levers (not shown) of the corresponding wheeled trucks are jointed to the ends of the respective body brake-levers 47 and 48, the former fulcrumed between two supporting-plates 49, (left end of Fig. 2,) whose ends are riveted to and upheld by two lattice-bars *d* and the latter having no stationary fulcrum. Loops 50 (right end of Fig. 2) under the sills *b* uphold the free ends of the levers. The rod 51 is jointed to the levers and communicates power to lever 47 when lever 48 is turned. As a hand-brake the turning of wheel 44 winds in the chain 42, which draws the rod 43 toward the end of the car and in so doing turns the levers 47 and 48 in the direction to apply the brakes, the lever 48 directly and the lever 47 through the rod 51. The lever 48 is also connected with the piston-rod 52 of the air-brake cylinder 53. This is shown as supported (along with its reservoir 54 and triple valve 55) by brackets 56, attached to the underframe.

At 57 is the train-pipe, secured to the sills *b* by clips 58 and terminating at each end in the usual angle-cock 59 and coupling-hose 50, Fig. 5.

At 61 is the pipe for emptying the tank.

At 62 is the running-board with ladders 63.

At 64 are grab-irons.

At 65 is a shaft mounted in bearings and having a lever-arm which is connected by a chain 66 with a coupler-pin to enable one to uncouple cars without going between them.

At 67 is a hand-rail.

The car can be used as tank-cars are commonly employed or in any desired way. It has great facility for making repairs, and it is believed that even with comparatively light tank it will be able to stand the conditions of modern railroading with an underframe of moderate weight and without requiring much repairing. Tanks which have been in use in the ordinary type of cars can be provided with the devices 4 and be mounted as described for tank *a*, and it is believed that the so-remodeled cars will compare favorably with cars embodying tanks of like condition remodeled on other systems. Such tanks naturally require more attention than new tanks to keep them from leaking. They will not stand the same pressures as new tanks The present invention enables the proper attention to be given to them with facility and the stresses to be apportioned between the tank and underframe, so as to utilize the tank to the best advantage as a stress-transmitting member.

In remodeling a tank-car having an underframe appropriately constructed to receive saddle-plates *e* these, in connection with bed-plank 2, attaching devices 5, tank-bands *z*, and tank-band brackets *y*, could be used with both an old underframe and an old tank, the latter being provided with the devices 4.

I claim as my invention or discovery—

1. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having in the tank connections with respect to such stresses a looseness which is taken up when a certain degree of buffing stress is attained, substantially as described.

2. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having in the tank connections with respect to such stresses a looseness which is taken up by a small movement against large resistance, substantially as described.

3. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having in the tank connections with respect to such stresses a looseness which is taken up by the shortening of said parallel member under compression within its limit of elasticity, substantially as described.

4. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having constant and uniform tank connections with respect to pulling stresses, along with a limited looseness in the tank connections with respect to buffing stresses, substantially as described.

5. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having adjustable pulling connections for the tank along with buffing connections therefor which are loose to a limited extent, substantially as described.

6. A railroad tank-car with stress-transmitting member parallel with the tank, characterized by having longitudinally-adjustable pulling connections for the tank, substantially as described.

7. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having a limited looseness with respect to buffing stresses in the connections of a tank which is held from independent longitudinal motion not required for taking up said looseness, substantially as described.

8. A railroad tank-car with stress-transmitting member parallel with the tank, characterized by having tank connections at the ends of the tank, which connections restrain independent longitudinal motion otherwise while allowing expansion of the tank or shortening of the said parallel member to take place, substantially as described.

9. A railroad tank-car with two parallel stress-transmitting members, one of which is constituted by the tank, said car having a limited looseness in the tank connections with respect to buffing stresses and also having said members interconnected to prevent independent longitudinal movement except as such movement may be required in taking up said looseness, substantially as described.

10. A railroad tank-car composed of a tank, an underframe, and wheeled trucks, and characterized by tank connections which are loose to a limited extent with respect to buffing stresses, substantially as described.

11. A railroad tank-car composed of a tank, an underframe, and wheeled trucks, and characterized by tank connections which are loose to a limited extent with respect to buffing stresses, but tight with respect to stresses tending to move the tank bodily on the underframe, substantially as described.

12. A railroad tank-car having the tank removable from the body-bolsters and the buffing and pulling appliances and provided

with attaching means which not only retain the tank in place on the body-bolsters, but also support the buffing and pulling appliances and transmit buffing and pulling stresses between them and the tank, substantially as described.

13. A railroad tank-car having a removable tank and also a parallel stress-transmitting member, the tank provided with attaching means which not only retain the tank in place on the body-bolsters, but also support the buffing and pulling appliances and transmit buffing and pulling stresses between them and the tank, substantially as described.

14. A railroad tank-car composed of a removable tank, an underframe, and wheeled trucks, and provided with tank-attaching means which not only retain the tank in place on the body-bolsters, but also support the buffing and pulling appliances and transmit buffing and pulling stresses between them and the tank, substantially as described.

15. A railroad tank-car having a saddle-plate under each end of a tank removably attached thereto, and also having buffing and pulling appliances permanently attached to said saddle-plate between the body-bolster and the end of the car, substantially as described.

16. A railroad tank-car having an underframe composed of cross-connected sills and saddle-plates, the former extending through the body-bolsters and receiving the buffing and pulling appliances between them, and the saddle-plates overlying said appliances and being permanently attached to said sills in proximity thereto so as to aid in upholding said appliances against stresses tending to depress the same, substantially as described.

17. A railroad tank-car having an underframe composed of cross-connected sills and saddle-plates permanently attached thereto, said sills extending through the body-bolsters, and the saddle-plates lying mainly between the bolster centers and the ends of the car, substantially as described.

18. A railroad tank-car having an underframe composed of cross-connected sills and saddle-plates permanently attached thereto, said sills extending through the body-bolsters, and the saddle-plates lying mainly between the bolster centers and the ends of the car and being attached to said sills between the bolsters and the ends of the car, substantially as described.

19. A railroad tank-car having saddle-plates and also longitudinal sills composed of flanged beams with flanges horizontal between said saddle-plates, these latter having seats on said sills conforming with their curvature, substantially as described.

20. A railroad tank-car having saddle-plates and also longitudinal sills composed of flanged beams with flanges horizontal between said saddle-plates and swaged under the latter to furnish seats conforming with the saddle-plates' curvature, substantially as described.

21. A railroad tank-car having stress-transmitting longitudinal sills, and also having means whereby buffing stresses are transmitted through the tank after being first received by the end portions of said sills, which car is further characterized by reinforcement of said end portions of the sills as compared with their middle portions, substantially as described.

22. A railroad tank-car having stress-transmitting longitudinal sills, and also having means whereby buffing stresses are transmitted through the tank after being first received by the end portions of said sills, which car is further characterized by saddle-plates secured to said end portions of the sills and connected with said tank for transmitting buffing stresses between it and the buffing and pulling appliances, substantially as described.

23. A railroad tank-car having saddle-plates which extend beyond the bolsters and are attached to the buffing and pulling appliances and which are also attached to the tank by tank-bands beyond the bolsters so that the ends of the tank constitute supporting cantilevers for upholding the buffing and pulling appliances, substantially as described.

24. A railroad tank-car having saddle-plates which extend beyond the bolsters and are attached to the buffing and pulling appliances and which are also removably attached to the tank beyond the bolsters so that the ends of the tank constitute supporting cantilevers for upholding the buffing and pulling appliances, substantially as described.

25. A railroad tank-car having saddle-plates located under the ends of the tank and removably connected therewith, and also having a separate set of bed-plank at each end of the tank between the latter and the corresponding saddle-plate, substantially as described.

26. A railroad tank-car having saddle-plates under the ends of the tank, and also having means for removably attaching each saddle-plate to the tank on both sides of the corresponding body-bolster, substantially as described.

27. A railroad tank-car having saddle-plates under the ends of the tank, and also having means for transmitting buffing stresses between said saddle-plates and tank and for removably attaching each saddle-plate to the tank on both sides of the corresponding body-bolster, substantially as described.

28. A railroad tank-car composed of a tank, an underframe, and wheeled trucks, said underframe being composed of longitudinal sills which receive the draft-rigging be-

tween them and with saddle-plates which overlie said draft-rigging, and said tank resting in said saddle-plates and connected therewith by tank-bands and by means to restrain independent longitudinal and rotary movement on the part of said tank, substantially as described.

29. A railroad tank-car having two sets of angle-pieces, bolted together, one set on the tank and the other set on parts by which the tank is supported, substantially as described.

30. A railroad tank-car having the tank connected with tank-supporting parts by bolts which extend lengthwise of the car, substantially as described.

31. A railroad tank-car having the tank connected with an underframe by bolts which extend lengthwise of the car, substantially as described.

32. A railroad tank-car having the tank connected with saddle-plates by bolts which extend lengthwise of the car, substantially as described.

33. A railroad tank-car having a tank with projecting devices on the bottom thereof on opposite sides of the longitudinal middle portion of said bottom, leaving the said middle portion clear, and also having means whereby buffing stresses can be communicated to the tank through said devices, substantially as described.

34. A railroad tank-car in which buffing stresses are transmitted through the tank by contact of projecting devices on the tank with tank-supporting parts with which said devices are out of contact in the absence of buffing stress, substantially as described.

35. A railroad tank-car composed of a tank, an underframe of longitudinal sills and saddle-plates, and wheeled trucks, and further characterized by projecting devices on the tank normally out of contact with opposing parts of the underframe and also by means for holding the tank in place on said underframe while allowing such motion as results from expansion of the tank or shortening of the underframe, substantially as described.

36. A railroad tank-car composed of a tank, an underframe of longitudinal sills and saddle-plates, and wheeled trucks, and further characterized by projecting devices on the tank normally out of contact with opposing parts of the underframe, yet near enough to come together upon shortening of the underframe under buffing stress, substantially as described.

37. In combination with an underframe of longitudinal sills and saddle-plates a tank provided with projecting devices secured to the tank laterally beyond the sills and longitudinally behind the saddle-plates, substantially as described.

38. In combination with an underframe, a removable tank provided with projecting devices having sloped faces for guiding the tank into position on the underframe, substantially as described.

39. In combination with an underframe, a removable tank provided with projecting devices having sloped faces for guiding the tank into position on the underframe, and vertical faces for communication of buffing stress when the tank is in position, substantially as described.

40. A railroad tank-car composed of an underframe, a tank, and wheeled trucks, and characterized by possessing each of the following features, namely, longitudinal sills extending through the body-bolsters and receiving the draft-rigging between them, saddle-plates lying mainly between the bolster centers and the ends of the car and being secured to said sills, tank-bands secured to said saddle-plates near the ends of the car, projecting devices secured to the tank laterally beyond said sills and longitudinally behind said saddle-plates, companion devices on said saddle-plates, and bolts between the two sets of devices, substantially as described.

41. A railroad tank-car having saddle-plates which lie mainly between the bolster centers and the ends of the car and which are provided near the car ends with combined tank-band brackets and push-pockets, substantially as described.

42. A combined tank-band bracket and push-pocket, substantially as described.

43. A push-pocket having a curved base, substantially as described.

44. A push-pocket composed of a curved base, a side wall, and a bottom, substantially as described.

45. A push-pocket composed of a curved base, a side wall, a back, and a bottom, substantially as described.

46. A combined bracket and push-pocket, composed of a base, a side wall, a ledge on one side of said wall to form the bottom of the push-pocket, and a ledge on the other side of said wall to form part of the bracket, substantially as described.

47. A railroad tank-car having sills which receive the draft-rigging between them and also having an open-bottomed nose-piece which is provided with lugs on opposite sides of the draw-bar opening in position to underlie the ends of a cross-support for said draw-bar, substantially as described.

48. A nose-piece having vertical attaching-flanges interconnected by a horizontal transverse web, and also having lugs on opposite sides of the draw-bar opening in position to underlie the ends of a cross-support for said cross-bar, substantially as described.

49. A nose-piece having a pulley-bracket secured thereto on one side of the draw-bar opening in said nose-piece, substantially as described.

50. A nose-piece having secured thereto a pulley-bracket in the form of a bent metal strip with its ends lapped and fastened to the nose-piece, substantially as described.

51. A pulley-bracket in the form of a bent metal strip with its ends brought together in a parallel position, provided with a lug for the end of the brake-chain, substantially as described.

52. A railroad tank-car having an underframe composed of longitudinal sills with outboard arms and center blocks, the center blocks which are located between said sills and are secured to the vertical webs thereof being open-topped and composed each of a horizontal plate and upright sides with a series of vertical transverse webs, substantially as described.

53. A center block for a bolster, composed of a horizontal plate, a circular disk on the under face of said plate, upright sides, and a series of transverse vertical webs, the spaces between said webs being open above, substantially as described.

54. A center block for a bolster composed of a horizontal plate, a circular disk on the under face of said plate, upright sides, and a number of transverse vertical webs decreasing in height toward the center, the spaces between said webs being open above, substantially as described.

55. A four-sided outboard bearing-arm, having a vertical web flanged on each of its four edges, and also having its bottom offset near its outer end to leave a side bearing, substantially as described.

56. A railroad tank-car having a tank with devices fastened thereto and arranged to make contact longitudinally of the tank with tank-supporting parts to which said tank is removably attached, and also having tight cover-plates inside the tank over the areas of fastening said devices, substantially as described.

57. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having on the cylindrical or body portion of the tank connections for such stresses in which connections is provided a looseness to be taken up when a certain degree of buffing stress is attained, substantially as described.

58. A railroad tank-car in which buffing stresses are transmitted jointly by the tank and a stress-transmitting member parallel thereto, characterized by having on the cylindrical or body portion of the tank connections for such stresses in which connections is provided a looseness to be taken up by a small movement against large resistance, substantially as described.

59. A railroad tank-car having tank seats or saddles underlying a removable tank not only at the regions of the body-bolsters, but also between said regions and the ends of the tank, and also having means for attaching the buffing and pulling appliances to said tank between said body-bolster regions and the ends of the tanks, substantially as described.

In testimony whereof I affix my signature in presence of two subscribing witnesses.

GEORGE LEE SOUTHARD.

Witnesses:
INEZ LOWE SOUTHARD,
C. E. FORCE.