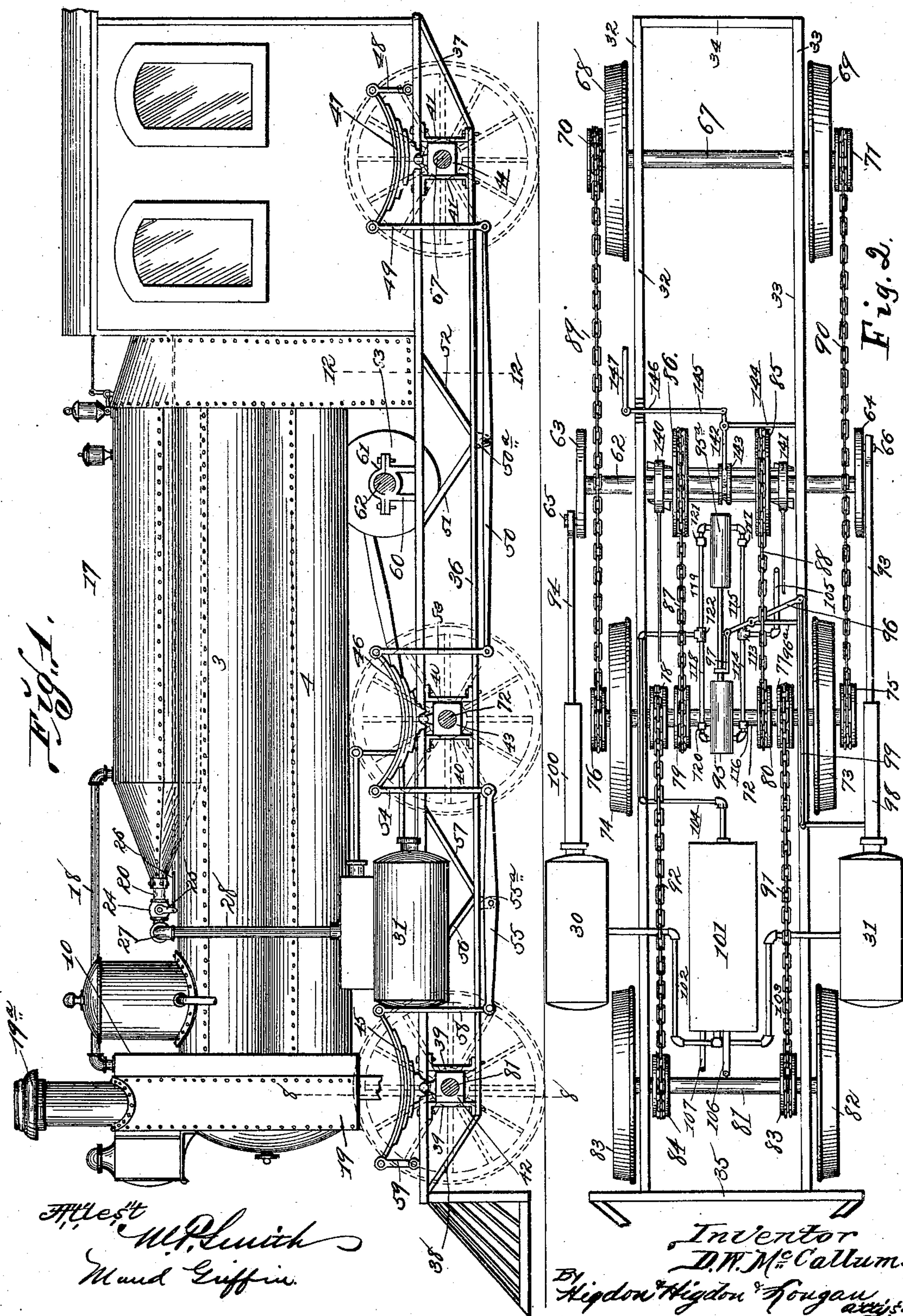


3 Sheets—Sheet 1.

No. 575,969.

Patented Jan. 26, 1897.





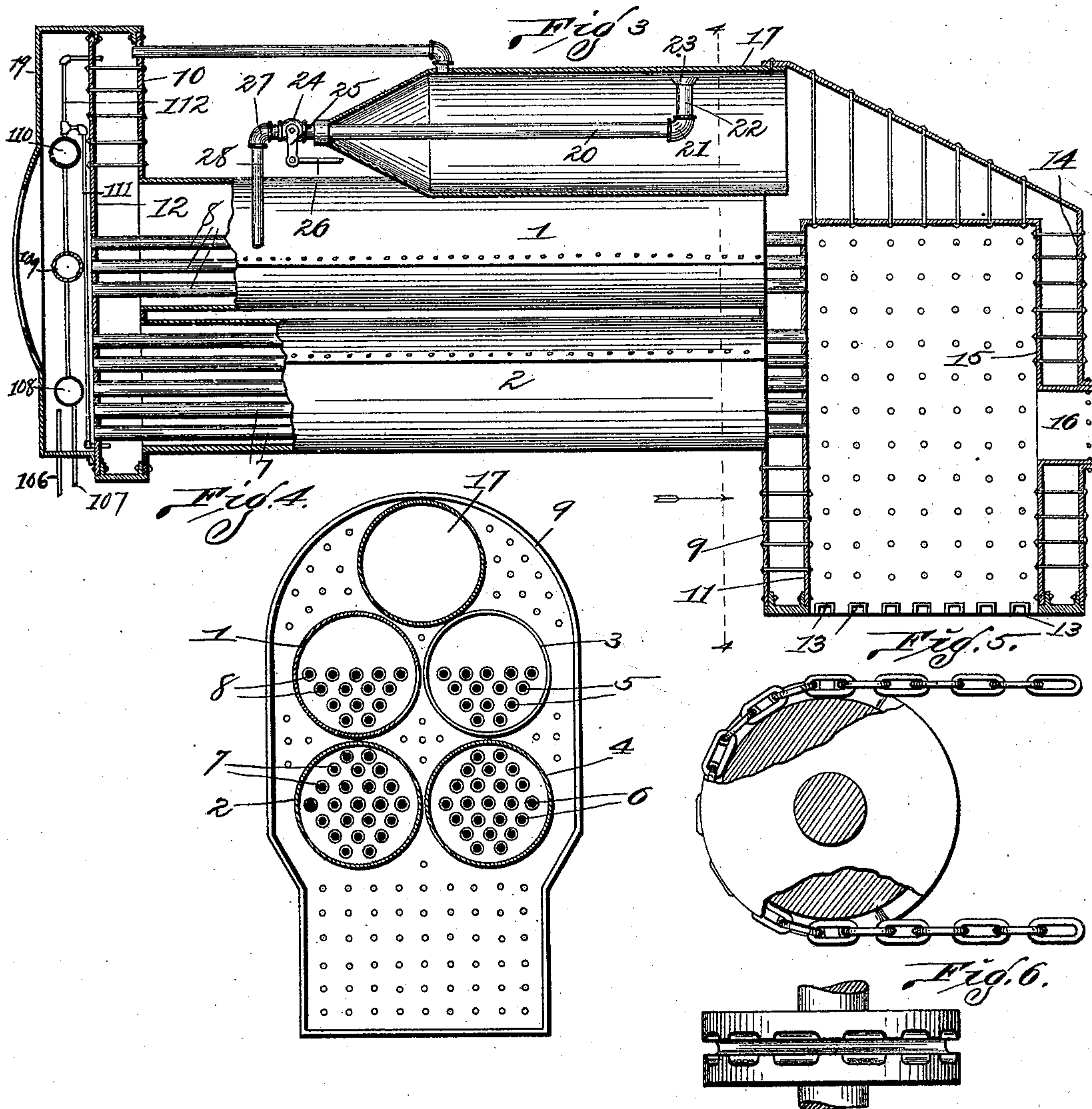
(No Model.)

3 Sheets—Sheet 2.

D. W. McCALLUM.  
LOCOMOTIVE.

No. 575,969.

Patented Jan. 26, 1897.



Attest  
M. B. Smith,  
Hand Griffen

Inventor:—  
D. W. McCallum  
By Higdon Higdon & Horgan  
Attys.

(No Model.)

D. W. McCALLUM.  
LOCOMOTIVE.

3 Sheets—Sheet 3.

No. 575,969.

Patented Jan. 26, 1897.

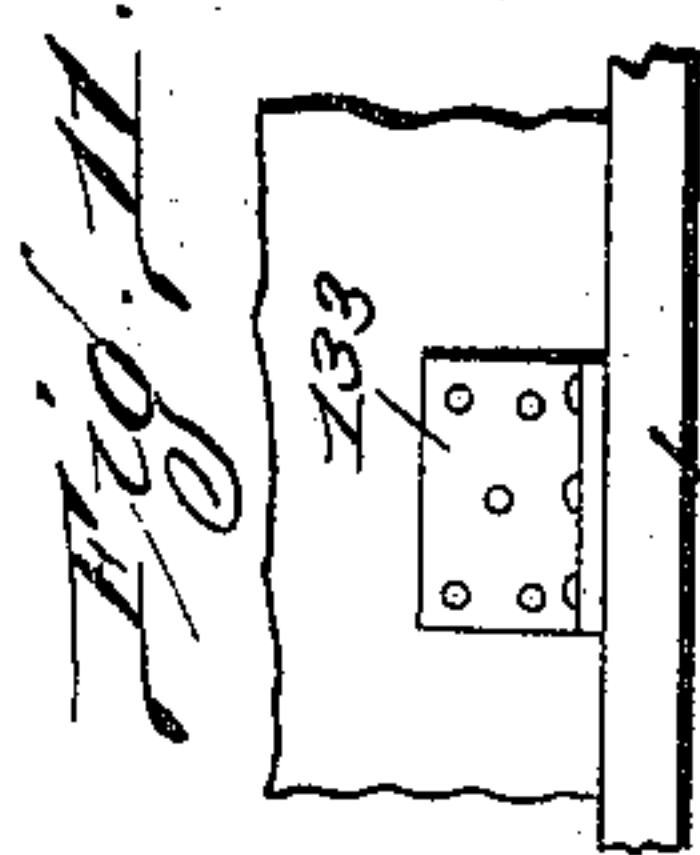
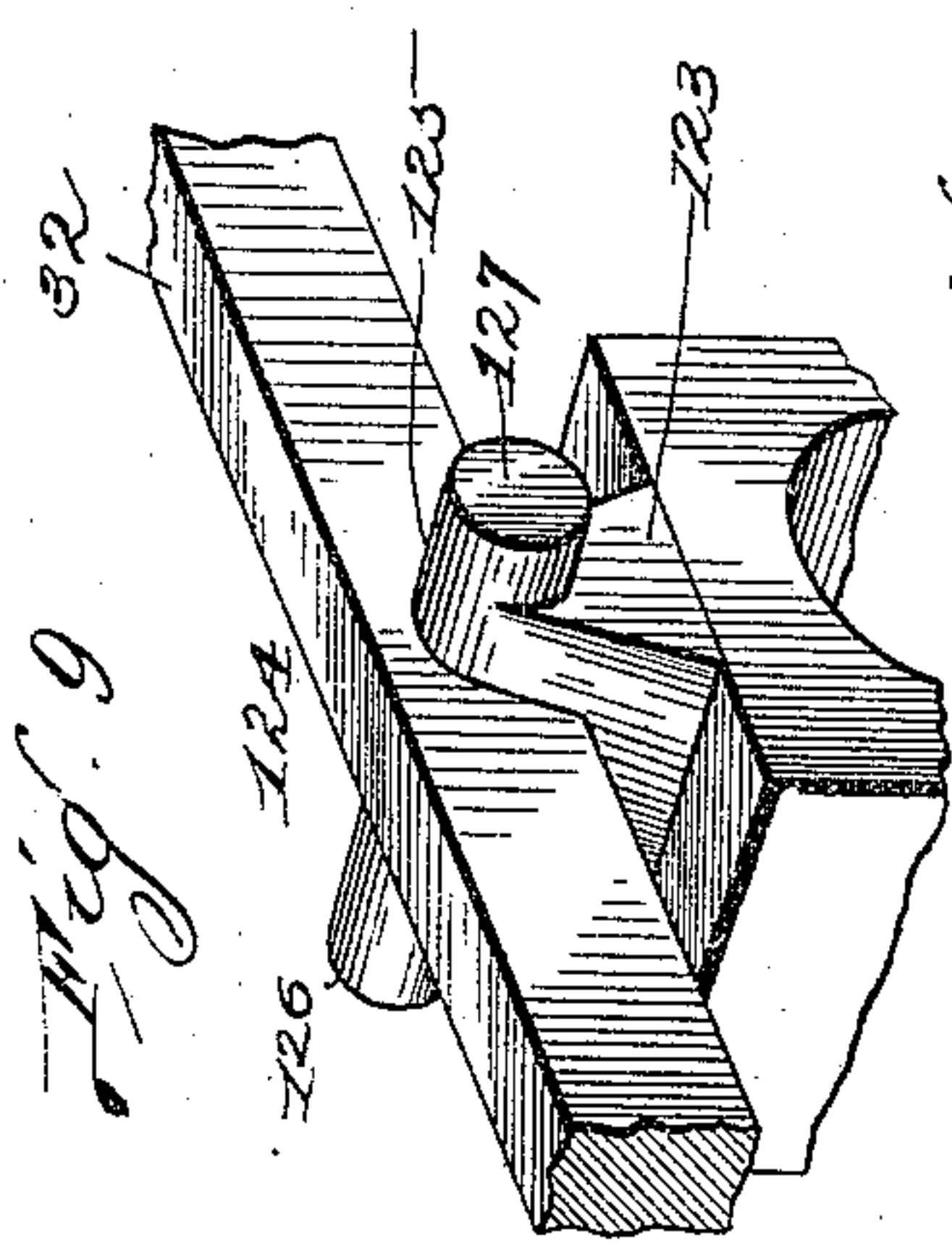
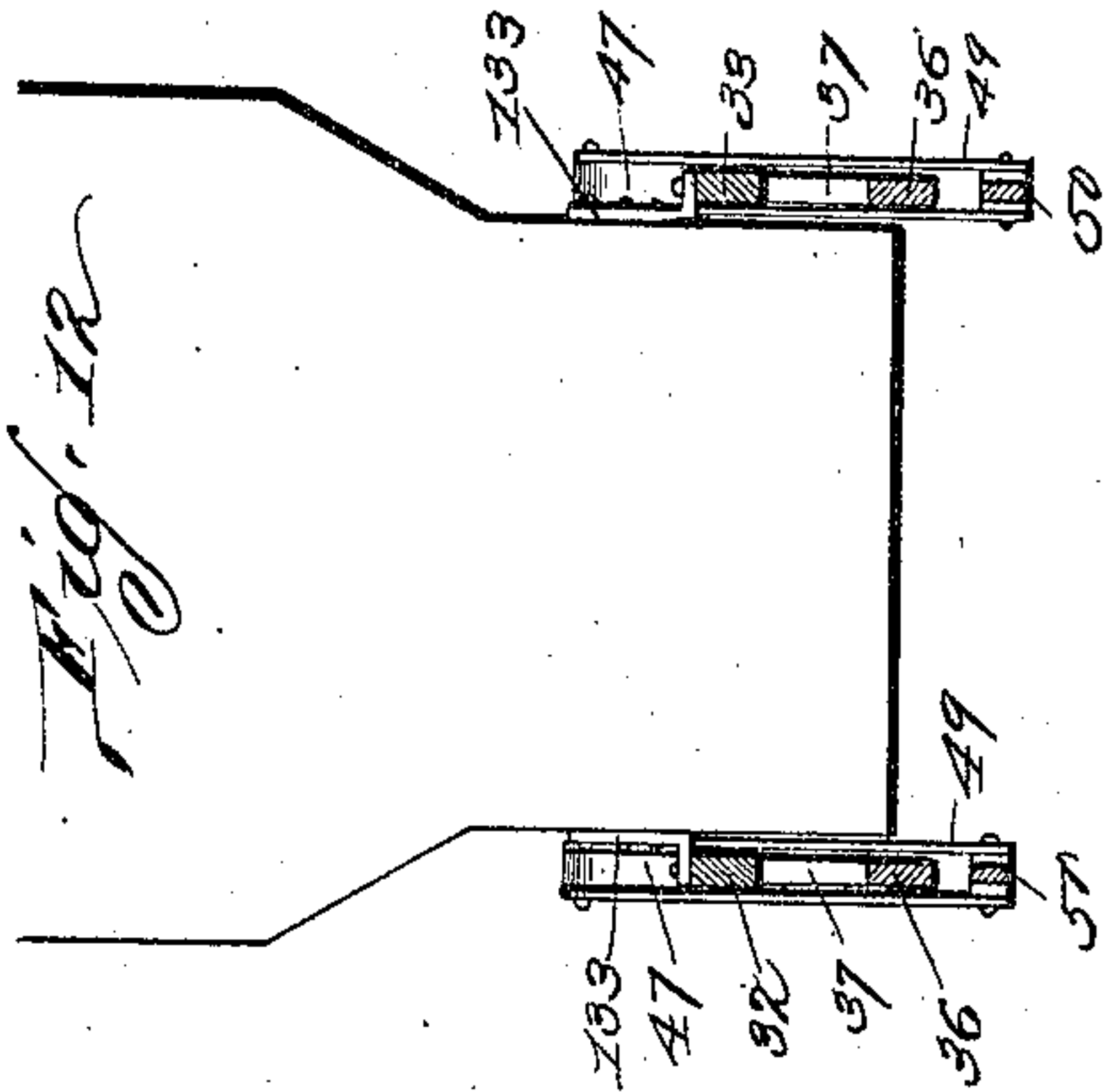
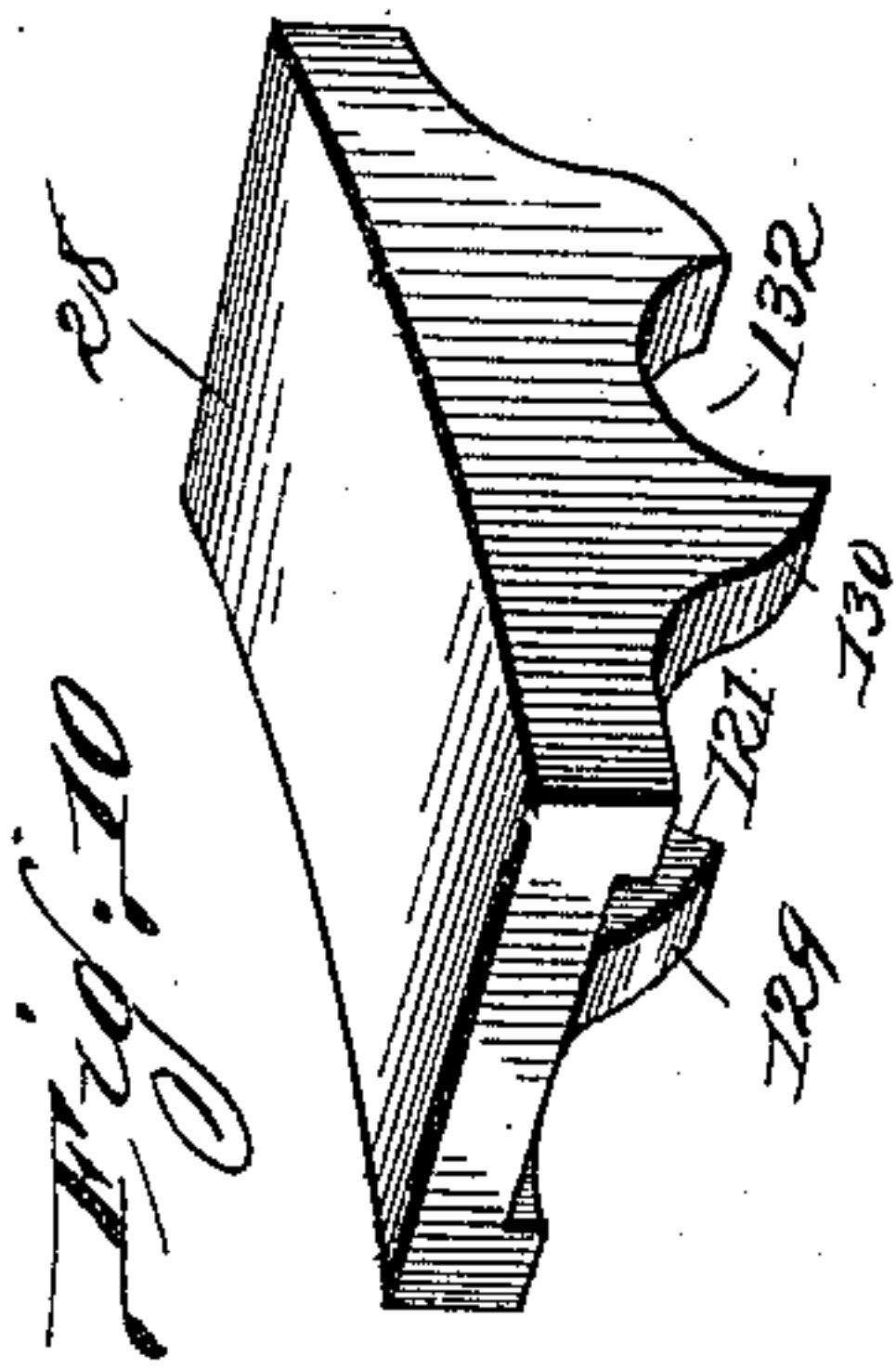
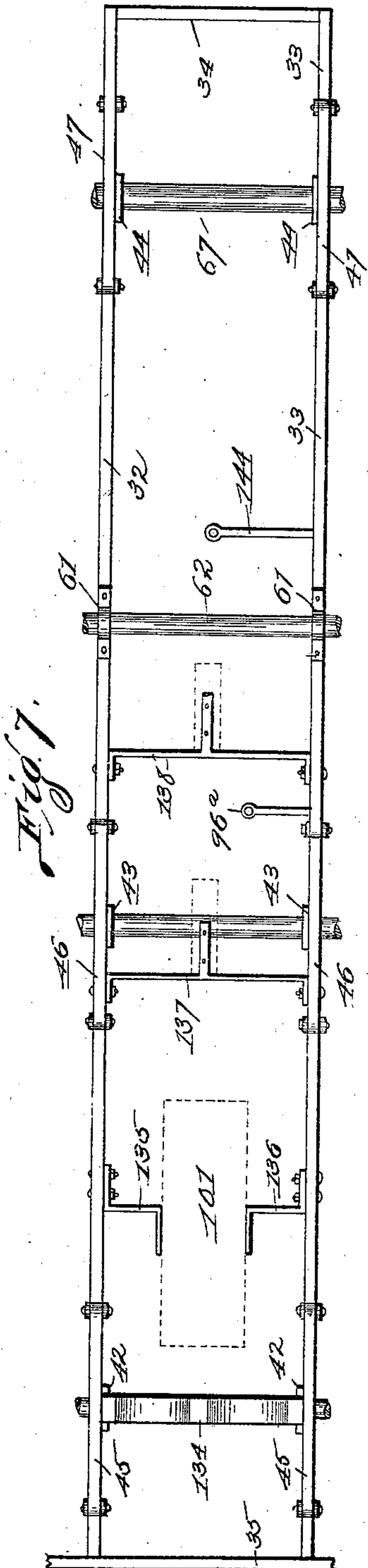
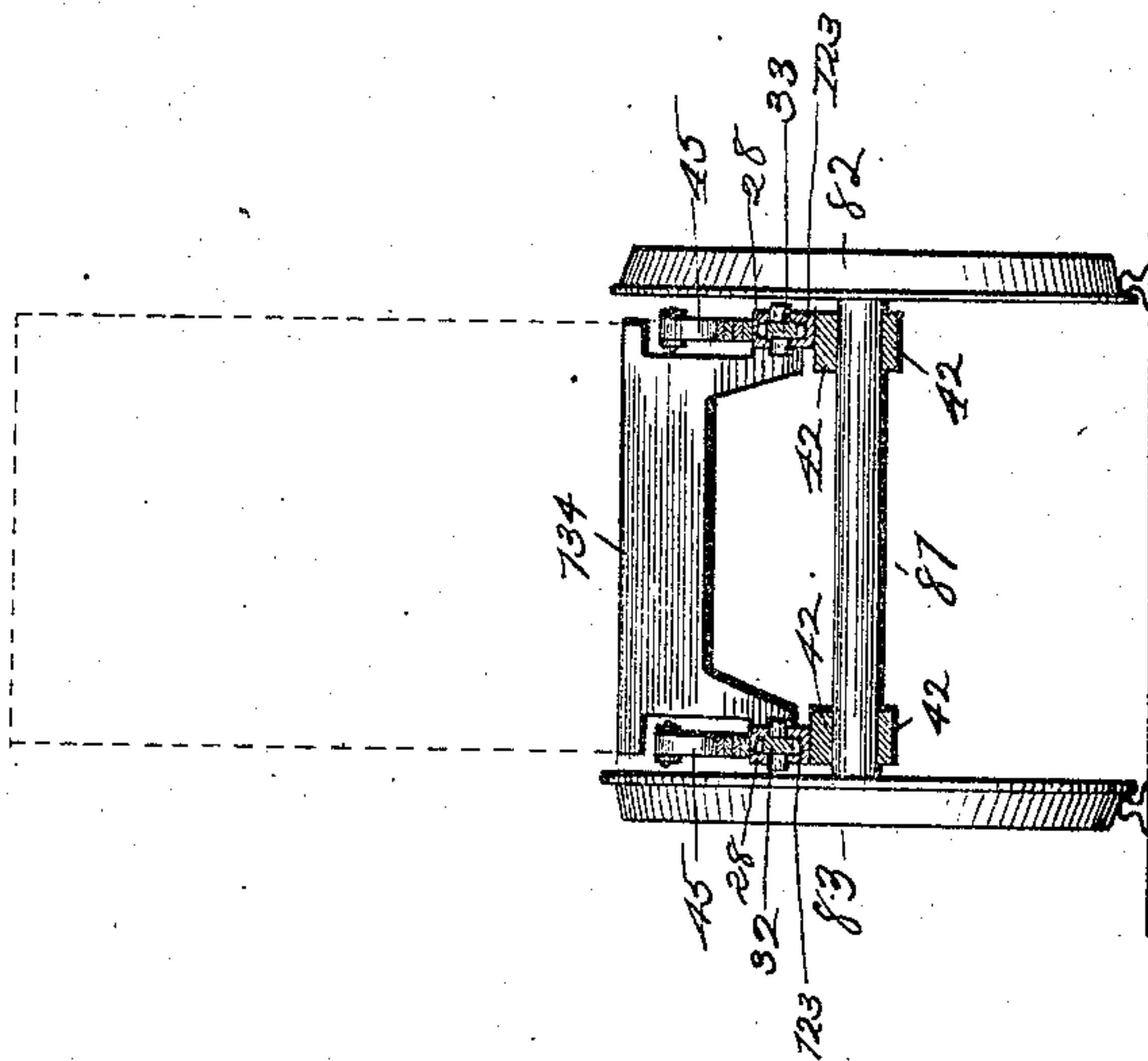


Fig. 8



Attest  
W. L. Smith  
Maud Griffin

Inventor:—  
D. W. McCallum.  
By Higdon & Higdon & Fongau  
Attys.



# UNITED STATES PATENT OFFICE.

DANIEL W. McCALLUM, OF ST. LOUIS, MISSOURI, ASSIGNOR OF TWO-THIRDS  
TO WILLIAM E. KUHLOFF, OF FORT WORTH, AND JEFF L. FINLEY, OF  
DENISON, TEXAS.

## LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 575,969, dated January 26, 1897.

Application filed April 8, 1896. Serial No. 586,658. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL W. McCALLUM, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Locomotives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved locomotive or traction-engine; and it consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of my improved high-pressure locomotive, drawn with especial reference to showing the upper part of the locomotive. The driving-wheels are shown in dotted lines, and the driving mechanism and connections are not shown. Fig. 2 is a top plan view of the running-gear. Fig. 3 is a longitudinal sectional elevation of the boiler shown in Fig. 1, taken on a line approximately through the center. Fig. 4 is a sectional view taken on the line 4 4 of Fig. 3. Fig. 5 is a side elevation, partly in section, of a lock-sheave and chain of which I make use. Fig. 6 is a top plan view of the lock-sheave shown in Fig. 5. Fig. 7 is a top plan view in detail of the frame and its connections. Fig. 8 is a vertical transverse sectional view taken on the line 8 8 of Fig. 1. Fig. 9 is a perspective of one part of the joint forming the connection between the driving-springs and the driving-box of the axle. Fig. 10 is the mating part of the joint shown in Fig. 9. Fig. 11 is a side elevation of the piece of the fire-box, showing the connection between the fire-box and the frame. Fig. 12 is a vertical transverse sectional view taken on the line 12 12 of Fig. 1.

In the construction of my improved locomotive I make use of my high-pressure steam-boiler, which is shown and described in detail in my application filed March 10, 1896, Serial No. 582,679. While the shape of the boiler is changed to suit the special purpose of a traction-engine or locomotive, the essential elements are the same as those shown in my prior application.

Referring by numerals to the drawings, 1, 2, 3, and 4 are the shells, in each of which is

located a series of flues 5, 6, 7, and 8, respectively. The shells are attached to the sheets 9 and 10, and the flues are attached to the sheets 11 and 12. The sheet 11 forms one side of the fire-box, and said fire-box has the grates 13 in the bottom thereof.

Between the rear sheet of the boiler and the rear sheet 15 of the fire-box is formed a rectangular shell through which is an aperture 16 for supplying fuel to the fire-box. The sheets 14 and 15 are attached together by stay-bolts in the usual way. A similar shell is formed between the sheets 9 and 11 in the rear of the fire-box. On top of the fire-box is a triangular shell communicating with the shells just described and with the steam-dome 17, which is a shell positioned above the shells 1 and 3 and constructed without flues. Between the sheets 10 and 12 is formed a rectangular shell extending upwardly to a level above the steam-dome 17, and a pipe 18 connects the upper part of this shell with the steam-dome.

Between the sheet 12 and the front end of the boiler 19 is a shell which forms the base of the smoke-stack 19<sup>a</sup>. A pipe 20 is positioned approximately in the longitudinal center of the steam-dome 17 and has an elbow 21 on its rear end, to which is attached a short piece of pipe 22, having the flaring outer end 23. In the forward end of the pipe 20 and outside of the steam-dome is an ordinary throttle-valve 24, to which is attached an arm 25 and connecting-rod 26 for operating said arm. Directly in front of the valve 24 is a T-coupling 27, from each end of which extend pipes 28 and 29, connecting with the steam-chests 30 and 31.

The frame which supports the boiler and superstructure of the locomotive or traction-engine consists of the horizontal parallel bars 32 and 33, which bars are connected together by the cross-bars 34 and 35. Below the bars 32 and 33 and parallel therewith are bars 36. The bars 36 are connected at their ends with the ends of the bars 32 and 33 by bars 37 and 38. Between the bars 36 and 33 are pairs of vertically-arranged parallel bars 39, 40, and 41, between which the driving-boxes 42, 43, and 44 of the driving-wheels operate.

Driving-springs 45, 46, and 47 are placed on



top of the driving-boxes 42, 43, and 44, with their outer ends curved upwardly. A spring-hanger 48 connects the rear end of the spring 47 with the equalizer 33, and a spring-hanger 5 49 connects the forward end of said driving-spring with the rear end of the equalizer 50, which beam is fulcrumed at its center to the lugs 50<sup>a</sup>, which are attached to and depend from the bars 36. Braces 51 and 52 are inserted directly above the lugs 50<sup>a</sup>, between the 10 bars 33 and 36.

A spring-hanger 53 connects the rear end of the driving-spring 46 with the forward end of said equalizer 50. A spring-hanger 54 connects the forward end of the driving-spring 15 46 with the rear end of the equalizer 55, which is fulcrumed at its center to the lugs 55<sup>a</sup>, which are attached to and depend from the bars 36. Braces 56 and 57 are inserted directly above the lugs 55<sup>a</sup>, between the bars 20 33 and 36.

A spring-hanger 58 connects the rear end of the driving-spring 45 with the forward end of the equalizer 55, and a spring-hanger 59 connects the forward end of the driving-spring 25 45 with the bar 33. The opposite side of the frame is essentially the same as that just described.

About midway between the boxes 43 and 44 30 an upright frame 60, supporting the bearing 61, is fixed to the bar 33, and a similar frame in horizontal alinement therewith is fixed to the bar 32. A driving-shaft 62 is mounted in the bearing 61, and on the end of said shaft 35 are disks 63 and 64, in the faces of which the crank-pins 65 and 66 are rigidly mounted. A shaft 67 is mounted in the boxes 44 transversely of the frame, and near each end of the shaft and outside of the frame is fixed ordinary car-wheels 68 and 69, and on the end 40 of said shaft 67, outside of said wheels, is fixed lock-sheaves 70 and 71.

Mounted in the boxes 43 and transversely of the frame is a shaft 72, and upon each end 45 of said shaft, outside of the frame, are car-wheels 73 and 74, and upon the extreme ends of said shaft and outside of said wheels are lock-sheaves 75 and 76. Lock-sheaves 77 and 78 are mounted upon said shaft 72 just inside 50 of the boxes 43, and lock-sheaves 79 and 80 are mounted upon said shaft 72 inside of said lock-sheaves 77 and 78.

A shaft 81 is mounted in the boxes 42 transversely of the frame, and car-wheels 82 and 55 83 are mounted upon the extreme ends of said shaft and outside of the frame, and lock-sheaves 83 and 84 are mounted upon said shaft 81 just inside of the frame. Lock-sheaves 85 and 86 are mounted upon the shaft 60 62 between the bars 32 and 33 inside of the bearings 61. Chains 87 and 88 connect the lock-sheaves 86 and 79 and the lock-sheaves 85 and 80, respectively. Chains 89 and 90 connect the lock-sheaves 70 and 76 and 71 and 65 75, respectively. Chains 91 and 92 connect the lock-sheaves 78 and 84 and 77 and 83, respectively. Main rods 93 and 94 connect the

crank-pins 65 and 66 with the pistons of the cylinders 30 and 31, respectively.

A double-action pump having the cylinders 70 95 and 95<sup>a</sup> is located above and behind the main driving-shaft 72 and directly in the center thereof. A lever 96, fulcrumed from the bar 33 by the arm 96<sup>a</sup> and connecting with the rod 97, operates said pump, one end of 75 said rod 97 being connected to the cross-head 98 of the engine 31 by the arm 99 and operated thereby.

100 indicates the cross-head of the engine 30.

A McCallum feed-water heater 101 is placed 80 between the shafts 72 and 81 and between the bars 32 and 33. Pipes 102 and 103 lead to said feed-water heater from the steam-chests, and said feed-water heater is supplied with water by the pipe 104, leading from the pump. 85 Said pump draws water from the tender-tank through the pipe 105. Pipes 106 and 107 lead from the feed-water heater into the base of the smoke-stack. The pipe 106 carries the exhaust-steam from the heater-coil contained 90 in the feed-water heater 101 and discharges it into the smoke-stack. The pipe 107 carries the hot water from said feed-water heater 101 and discharges it into the lower shell 108 of the secondary heater located within the base 95 of the smoke-stack. The shells 109 and 110 are connected successively to the shell 108, and the hot water passes from the pipe 107 through the three shells 108, 109, and 110, 100 respectively, and out through the pipe 111, and by said pipe 111 is carried down in front of the sheet 12 and discharged into the bottom of the boiler, as shown in Fig. 3. The steam generated within the feed-water heater passes out of the shell 110 and up through 105 the pipe 111 and upward through the pipe 112 and is discharged through the upper part of the sheet 12 into the boiler. The feed-pipe 105 is connected by the T-coupling 113 to the pipes 114 and 115. An inlet-valve 116 110 is located in the pipe 114 and a similar inlet-valve 117 is located in the pipe 115.

The pipe 114 communicates with the pump-cylinder 95 and the pipe 115 with the pump-cylinder 95<sup>a</sup>. On the opposite side of said 115 pump-cylinders are located pipes 118 and 119, and connect, respectively, to the pump-cylinders 95 and 95<sup>a</sup>. In the pipe 118 is an outlet-valve 120 and in the pipe 119 is a similar outlet-valve 121, and by the T-coupling 122 said 120 pipes 118 and 119 are connected to the pipe 104, leading to the feed-water heater 101. Inside of the said feed-water heater 101 is the usual steam-heater coil, supplied by the exhaust-steam from the steam-chests 30 and 31 125 through the pipes 102 and 103. The water discharged into the feed-water heater through the pipe 104 circulates around this coil.

In Figs. 9 and 10 are shown enlarged views, 130 in detail perspective, of the connection between the springs and the boxes of the axles. This connection comprises a plate 123, resting directly upon top of the driving-box of the axle. On the end of this plate are up-



wardly-projecting arms 124 and 125, and extending outwardly from the upper ends of said arms, and in horizontal alinement with each other, are lugs 126 and 127. The plate 123 and said arms and lugs attached thereto is designed to have either of the bars 32 or 33 operate directly above the center of said plate and between said arms. The plate 128 has downwardly-projecting edges 129 and 130, in which are formed the semicircular recesses 131 and 132 in horizontal alinement with each other, and designed to fit and operate upon the upper end of the arms 124 and 125 and the lugs 126 and 127. The springs fit directly on top of said plate 128. The recess between the downwardly-projecting edges 129 and 130 is deep enough to allow of the action of the spring.

Brackets 133 are attached to each side of the fire-box and rest directly upon the frame 32 and 33, as shown in Fig. 12. A bridge 134 is placed transversely of the front end of the boiler, and its ends rest upon the frame 32 and 33, as indicated in Fig. 8. Arms 135 and 136, attached to the frame 32 and 33, project inwardly and support the feed-water heater 101. Bars 137 and 138 are positioned transversely of the frame and have their ends attached to the frame 32 and 33, and said bars support the pump. The valves of the steam-chests are controlled by eccentrics 140 and 141 in the usual way. The eccentrics 140 and 141 are controlled by the engineer by means of the shifting rod 142, operating in the grooved collar 143 and fulcrumed to the bar 33 by the arm 144, and attached to the free end of the shifting rod 142 is a rod 145, operating in a slot 146, attached to the bar 32, and pivoted to the outer end of said rod 145 is a rod 147, communicating with the cab, by which said rod 145 is reciprocated to move the shifting rod and reverse the engine.

In the operation of my improved locomotive the connecting-rods 93 and 94 operate in the cylinders 30 and 31 in the usual way and rotate the driving-shaft 62, carrying the lock-sheaves 85 and 86, thus driving the chains 87 and 88, which chains communicate motion to the driving-wheels 79 and 80 and rotate the driving-shaft 72, thereby driving the lock-sheaves 77 and 78, and through the chains 91 and 92 rotating the shaft 81, and through the chains 89 and 90 rotating the shaft 67. It will be noticed that the lock-sheaves 85 and 86 are twice the diameter of the lock-sheaves 79 and 80. This construction is used where high speed is desired; but in freight-engines for hauling heavy loads the lock-sheaves 85 and 86 are placed upon the driving-shaft 72 and the lock-sheaves 79 and 80 are placed upon the driving-shaft 62, thus increasing the strength of the engine and decreasing the speed of the locomotive. By changing and interchanging the lock-sheaves on the shafts 62 and 72 the relative speed and strength of the locomotive may be varied to suit the occasion without changing the size of the drive-

wheels. Another great advantage of this construction lies in the fact that the driving-wheels in front of the cylinders are driven the same as the other driving-wheels, and thus one-third more power is gained by the additional friction between the drive-wheels and the rails than can be accomplished by the old construction of placing the ordinary lifeless truck under the front end of the locomotive. By using the McCallum high-pressure steam-boiler and the McCallum feed-water heater much saving in water and fuel is accomplished, and a corresponding saving is made in the dead-weight of the locomotive to be transported. The fact that the locomotive is lighter in proportion to its strength and that the friction between the wheels and rails is divided up among all the wheels makes the locomotive much easier on the road-bed and rails, and consequently much safer and less liable to be derailed. The entire weight of the engines and boilers rests upon the driving-wheels, and there are no counterbalances required in said driving-wheels and no heavy connecting-rods between said driving-wheels.

Instead of the usual connecting-rods, I employ a double train of chain-gearing as a safety precaution, in order that if one train should break or become disabled the remaining train will still continue to operate the driving-wheels. By this construction the locomotive is much less liable to be derailed by passing over stock or other obstructions upon the track.

Any number of driving-wheels may be used in my improved locomotive, and this construction will be found very useful not only for railroad-locomotives, but for street-motors, farm-engines, and any other purposes to which a traction-engine is suitable.

I claim—

1. In a locomotive, a series of water-shells each containing a series of fire-flues, a feed-water heater, a pipe discharging water from said feed-water heater into the lower ones of said water-shells and a pipe discharging steam from said feed-water heater into the upper ones of said water-shells, substantially as specified.

2. In a locomotive, a series of water-shells, each containing a series of fire-flues, a feed-water heater, a pipe discharging water from said feed-water heater into the lower ones of said water-shells, a pipe discharging steam from said feed-water heater into the upper ones of said water-shells, and a double-action plunger-pump connected to and operated by the cross-head of the engine for the purpose of feeding water to the feed-water heater, substantially as specified.

3. In a locomotive, a series of water-shells, each containing a series of fire-flues, a feed-water heater, a pipe discharging water from said feed-water heater into the lower ones of said water-shells, a pipe discharging steam from said feed-water heater into the upper ones of said water-shells, a double-action



plunger-pump connected to and operated by the cross-head of the engine for the purpose of feeding water to the feed-water heater, and pipes discharging the exhaust from the steam-chest into said feed-water heater, substantially as specified.

4. In a locomotive, a series of shells, each containing a series of fire-flues, a feed-water heater, a double-action plunger-pump supplying said feed-water heater, said pump being operated by connections with the cross-head of the engine, pipes discharging the exhaust from the steam-chests into said feed-water heater, pipes discharging the exhaust from said feed-water heater into the smoke-stack, auxiliary feed-water heaters located in the base of the smoke-stack, a pipe discharging the water from the first-mentioned heater into said auxiliary heater, and pipes discharging the steam from said auxiliary heaters into the upper ones of said water-shells and a pipe discharging the water from said auxiliary heaters into the lower of said water-shells, substantially as specified.

5. In a locomotive, a series of water-shells, each containing a series of fire-flues, a feed-water heater discharging water into said shells, a shell, constituting the steam-dome, above said shells, pipes leading from said steam-dome, steam-chests at the outer ends of said pipes, cylinders connected to said steam-chests, pistons in said cylinders, connecting-rods attached to the piston-rods, a shaft positioned transversely under the rear ends of said shells, crank-arms upon the ends of said shaft and connected to said connecting-rod, a pair of sheaves upon said shaft, a pair of sheaves upon the shaft of the central truck of the locomotive and in alinement with

the first-mentioned pair of sheaves, chains connecting said sheaves, a second pair of sheaves upon the shaft of said truck, a pair of sheaves upon the axle of the front truck and in alinement with said second pair of sheaves, chains connecting said second pair of sheaves with the last-mentioned pair of sheaves, substantially as specified.

6. In a locomotive, a series of water-shells, each containing a series of fire-flues, a feed-water heater discharging water into said shells, a shell above said water-shells, and constituting the steam-dome, steam-pipes leading from said steam-dome, steam-chests at the ends of said steam-pipes, steam-cylinders connected to said steam-chests, pistons in said steam-cylinders, connecting-rods attached to the piston-rods, a shaft positioned transversely of the locomotive, crank-arms upon the ends of said shaft and connected to said connecting-rod, a pair of sheaves upon said shaft, a second pair of sheaves upon the axle of the center truck, chains connecting the first and second pair of sheaves, a third pair of sheaves upon the axle of said truck, a fourth pair of sheaves upon the axle of the forward truck, chains connecting said third and fourth pairs of sheaves, a fifth pair of sheaves upon the ends of the axle of the center truck, a sixth pair of sheaves upon the ends of the axle of the rear truck, and chains connecting said fifth and sixth pairs of sheaves, substantially as specified.

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

DANIEL W. McCALLUM.

Witnesses:

MAUD GRIFFIN,  
S. G. WELLS.