H. M. GABEL.

AUTOMOBILE FIRE ENGINE.

APPLICATION FILED AUG. 17, 1912.

1,047,197.

Patented Dec. 17, 1912.

5 SHEETS—SHEET 1.

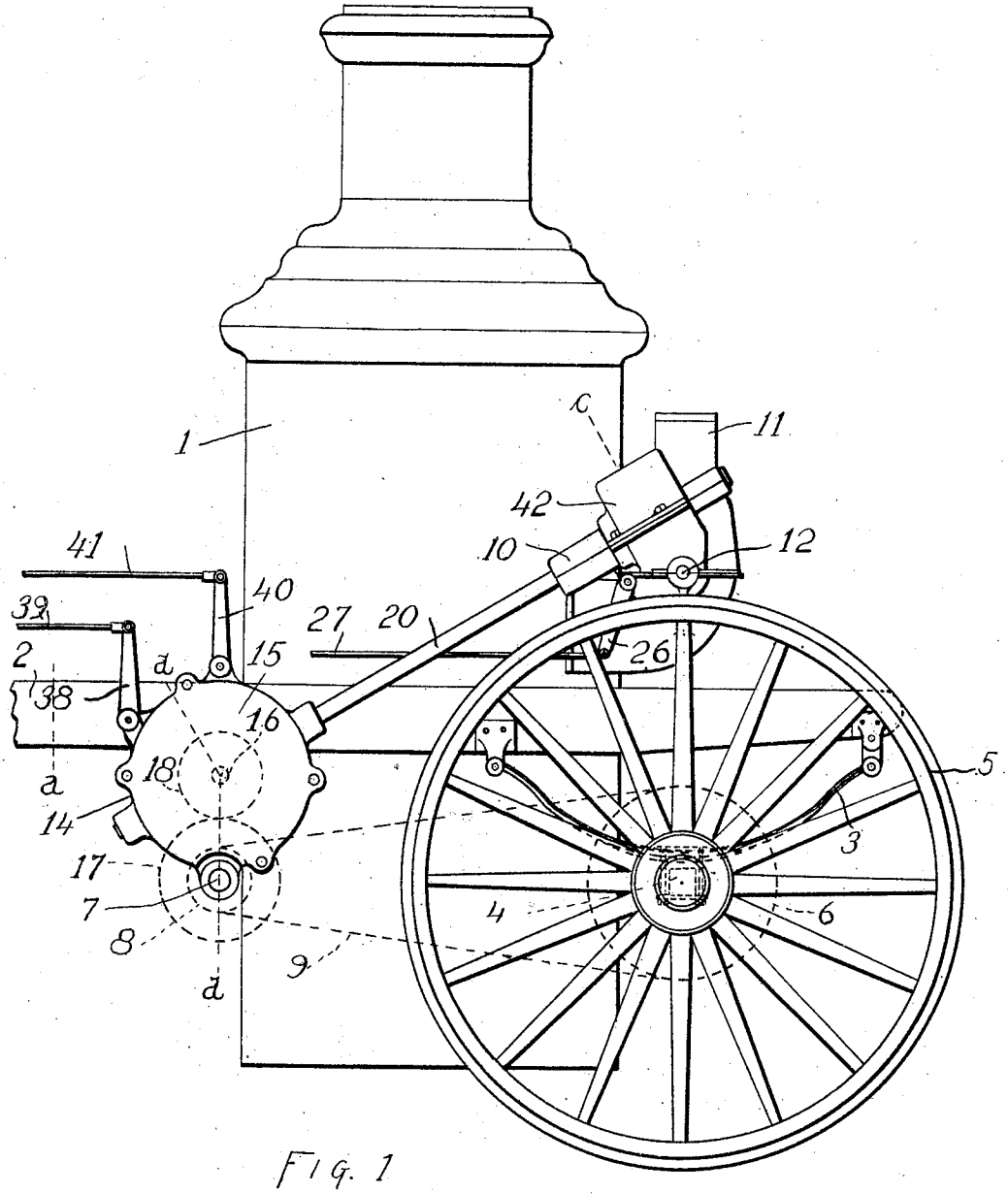

FIG. 1

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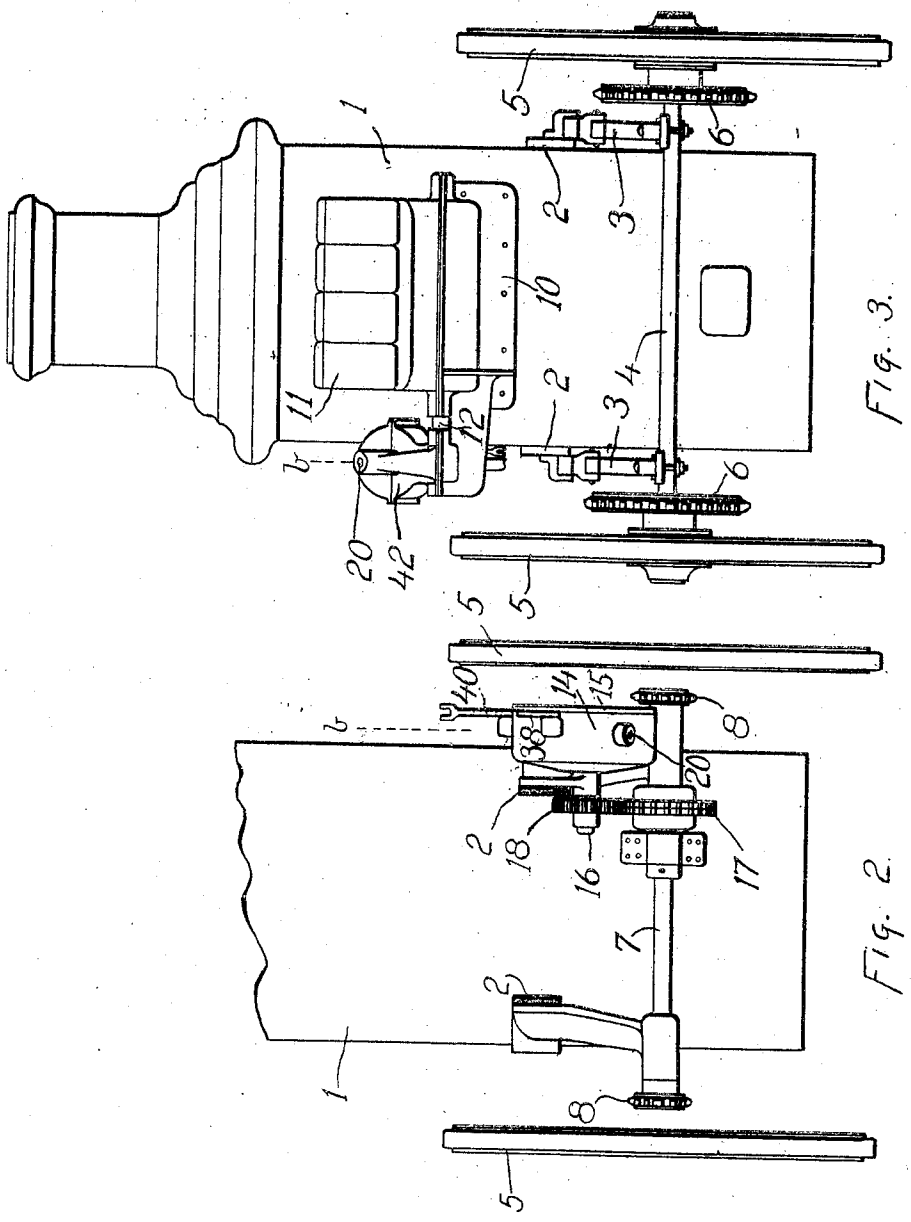

FIG. 3.

FIG. 2.

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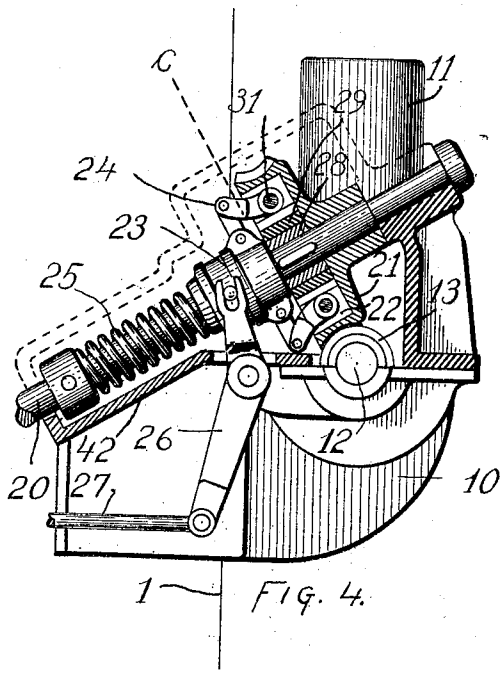

Fig. 4.

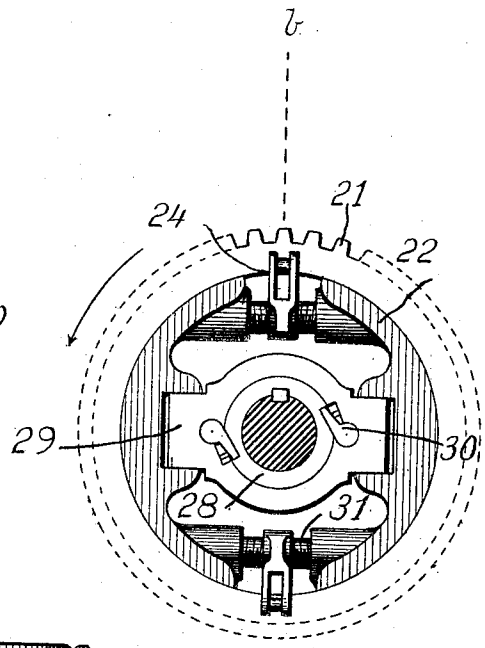

Fig. 5.

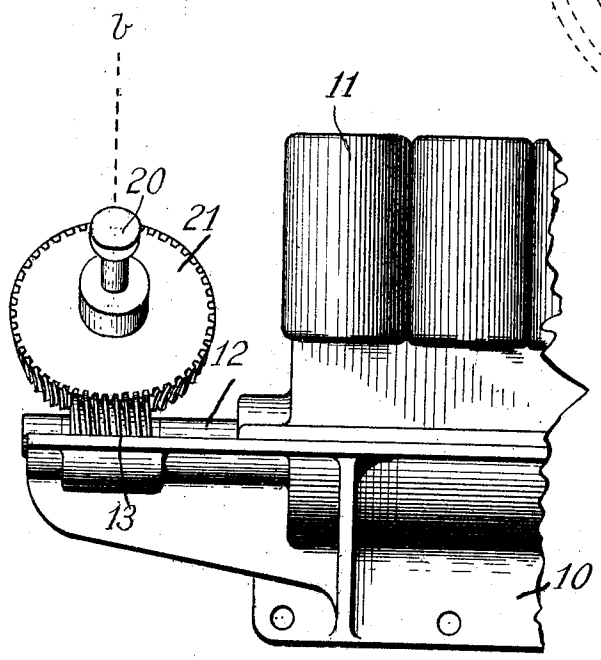

Fig. 6.

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5 SHEETS—SHEET 4.

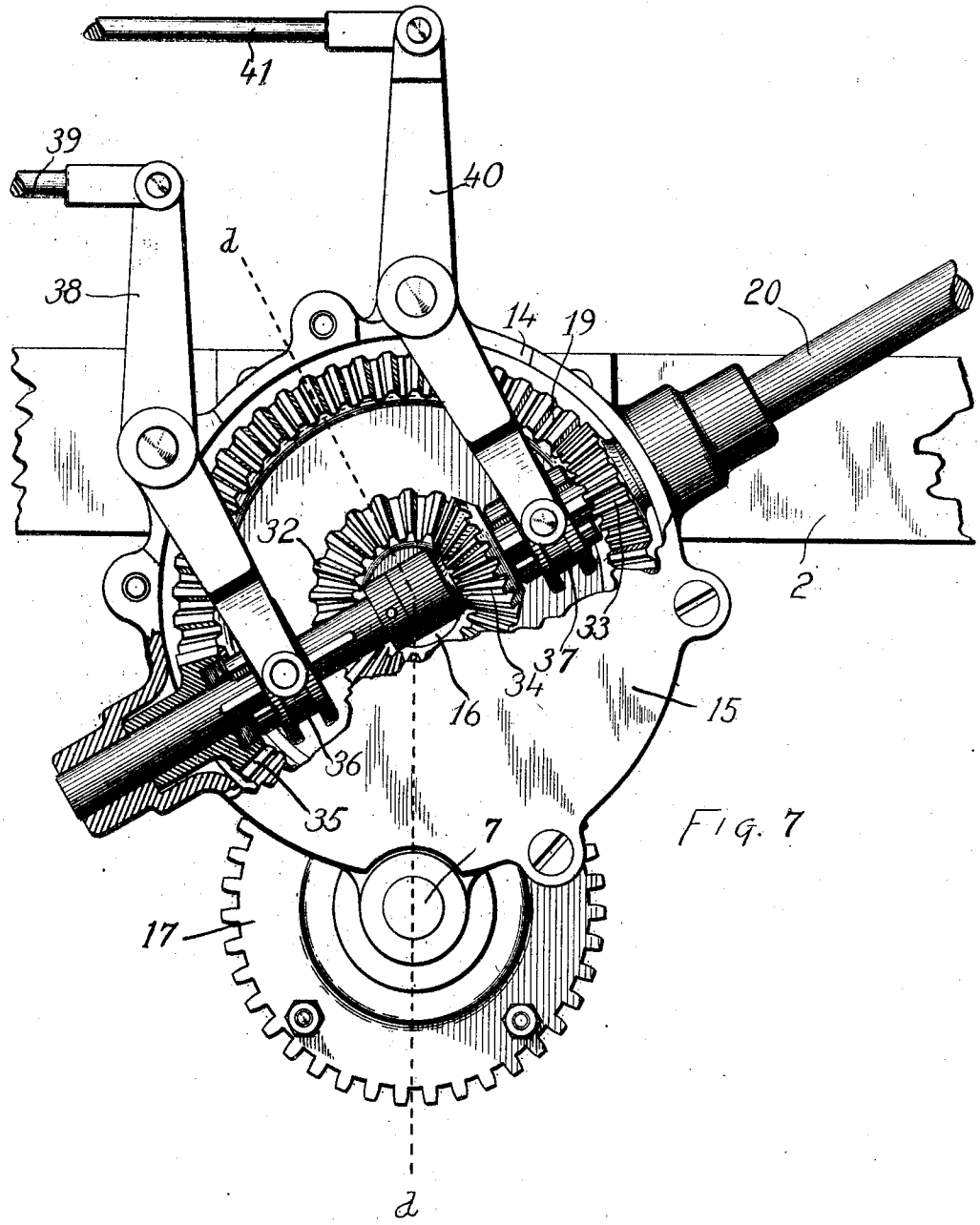

FIG. 7

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5 SHEETS—SHEET 5.

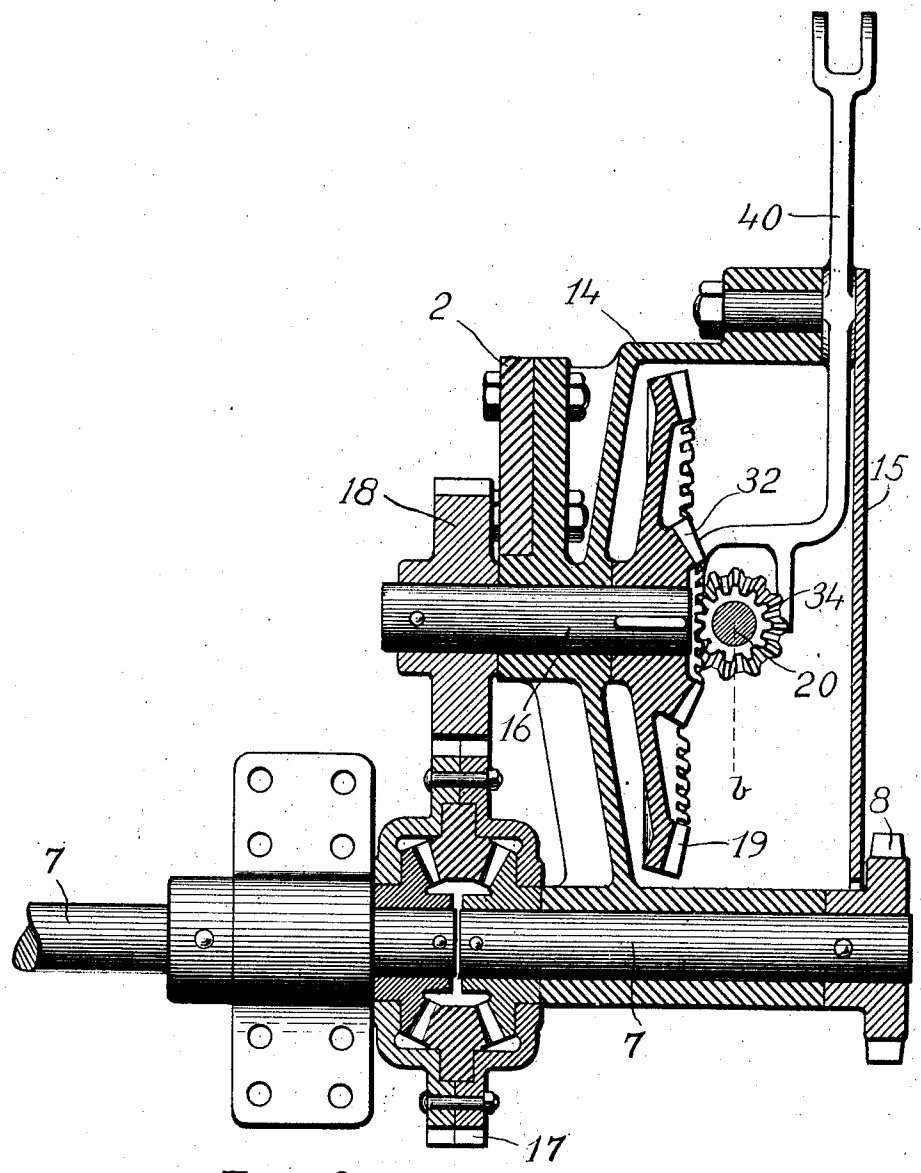

FIG. 8.

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UNITED STATES PATENT OFFICE.

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AUTOMOBILE FIRE-ENGINE.

1,047,197. Specification of Letters Patent. Patented Dec. 17, 1912.

Application filed August 17, 1912. Serial No. 715,556.

To all whom it may concern:

Be it known that I, HENRY M. GABEL, a citizen of the United States, residing at Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Automobile Fire-Engines, of which the following is a specification.

The design and construction of automobile fire engines in cases permitting of the original planning out of complete structures has resulted in a number of admirable and efficient organizations. But there is at present in use a large number of horse-drawn fire engines of a type comprising an upright boiler straddled by a pair of frame-girders firmly secured to the boiler and supported by the four wheels of the engine, the forward portions of the girders supporting the pump and driver's seat, etc., the axle for the front wheels of the engine being swiveled to the front portion of the frame formed by the girders. There are so many engines of this type in successful use and their performance is so eminently satisfactory that long pause is to be given to the thought of abandoning these existing structures in favor of entirely new structures of automobile type.

My present invention has for its object the retention of these admirable old fire engines and the addition to them of automobile features without seriously dismantling the present structures.

My invention will be readily understood from the following description taken in connection with the accompanying drawings in which:—

Figure 1 is a side elevation of the rear portion of a fire engine of the type above referred to but provided with automobile additions exemplifying my invention. Fig. 2 a front elevation of the machine, the frame-girders appearing in vertical section in the plane of line *a* of Fig. 1: Fig. 3 a rear elevation of the engine: Fig. 4 a side elevation of the gas engine, the reducing gear and clutch appearing in vertical longitudinal section in the plane of line *b* of Figs. 2, 3, 5 and 6: Fig. 5 a front elevation of the worm gear and clutch, the transmission shaft appearing in transverse section in the plane of line *c* of Figs. 1 and 4: Fig. 6 a rear elevation of a portion of the gas engine, the casing of the reducing gear being removed: Fig. 7 a side elevation of the speed-changing and reversing gear, portions appearing in vertical transverse section in the plane of line *b* of Figs. 2, 3, 5, 6 and 8: and Fig. 8 a transverse section of the speed-changing and reversing gear in the plane of line *d* of Figs. 1 and 7.

In the drawings:—1, indicates the upright boiler usual in the type of fire engines heretofore referred to: 2, the usual frame-girders straddling the boiler and firmly secured to its sides and projecting to the rear of the boiler for connection with the rear wheels and projecting forward of the boiler for connection with the front wheels and for the support of the pump, the driver's seat, etc.: 3, the usual half-elliptical springs supported under the rear projections of the frame-girders: 4, the rear axle crossing the rear of the boiler and secured to intermediate portions of the springs: 5, the rear wheels mounted on the rear axle, all of the parts thus far referred to being as usual in steam fire engines of the type referred to: 6, a sprocket-wheel fast upon each of the rear wheels: 7, a two-piece counter-shaft disposed across the front of the boiler below the frame-girders, and journaled in bearings supported by the girders and boiler, this countershaft being divided lengthwise at the point where the differential gear is secured to it, as indicated in Fig. 8: 8, a sprocket-wheel on the outer end of each division of the countershaft, these sprocket-wheels being in line with the sprocket-wheels 6 on the rear wheels of the engine: 9, sprocket-chains, one at each side of the boiler, engaging the sprocket-wheels 6 and 8 whereby the turning of the divided countershaft may transmit motion to the rear wheels of the engine: 10, a bracket firmly secured to the upper portion of the rear of the boiler, this bracket forming the crank-case and shaft-housing for a superposed gas engine: 11, the vertically disposed cylinders of the gas engine secured over the crank-case portion of the bracket 10, the cylinders of the gas engine being arranged side by side in a rank parallel with the rear axle: 12, the crank-shaft of the gas engine, the same projecting from the gas engine to a point beyond one side of the boiler: 13, a worm secured to the projecting portion of the crank-shaft so that all or a portion of the length of the worm will be outside the vertical plane of the side of the boiler: 14, a circular casing rigidly secured to the girder

at that side of the boiler at which is disposed the worm 13, this casing forming an inclosure for the speed-changing and reversing gears, the casing being disposed above and near countershaft 7: 15, a removable cover-plate forming the outer wall of casing 14: 16, a jack-shaft journaled in the axis of the inner wall of casing 14: 17, a differential gear, of ordinary type, mounted on the contiguous ends of the divisions of countershaft 7, one of the final members of this differential gear being secured to each division of the countershaft, the receiving member of this differential gear being a spur gear turning idly relative to the countershaft and carrying the planetary pinions which drive the final members of the differential: 18, a spur gear fast on the inner end of shaft 16 and engaging the receiving spur gear of the differential: 19, a bevel gear disposed within casing 14 and fast upon the outer end of shaft 16: 20, a diagonally disposed transmission shaft disposed at the side of the boiler at which are disposed worm 13 and casing 14, the upper end of this shaft crossing above the worm and being journaled in a housing supported by bracket 10, as indicated in Fig. 4, the lower end of the shaft crossing casing 14 diametrically and having journals in the rim of that casing, as indicated in Fig. 7: 21, a worm-gear loose on the upper portion of shaft 20 and having its lower portion engaged by worm 13 on the crank-shaft of the gas engine, this worm-gear having its rear face recessed to form the female member of a friction clutch: 22, a pair of clutch shoes disposed within the recess of the worm gear and radially movable therein, these shoes forming the male element of the friction clutch: 23, a sleeve adapted to slide on shaft 20 below the worm-gear: 24, toggles connecting this sleeve and the friction shoes in such manner that the downward movement of the sleeve tends to straighten the toggles: 25, a spring acting between the sleeve and a collar on shaft 20 and tending to urge the toggles to their greater degree of flexure: 26, a lever pivoted to bracket 10 and connected with sleeve 23 in such manner that the oscillations of the lever may move the sleeve endwise upon shaft 20: 27, a clutch-operating rod extending from lever 26 forwardly and adapted to have connection with actuating mechanism within reach of the driver at the front portion of the fire engine structure: 28, a hub fast on shaft 20 within the worm-gear and provided with forwardly facing peripheral ratchet-teeth: 29, a driver mounted to turn loosely on hub 28 and provided with radial arms slidingly engaging recesses in the inner faces of the clutch-shoes 22: 30, pawls carried by driver 29 and adapted to engage with the ratchet teeth of hub 28: 31, right and left hand screws threaded into the contiguous faces of the ends of the clutch-shoes and having mounted fast upon them the hubs of the upper arms of toggles 24, the arrangement being obviously such that when, through the medium of rod 27 and lever 26, sleeve 23 is moved downward, against the resistance of spring 25, the toggles will be more or less straightened and the right and left hand screws turned and the clutch-shoes forced outward into frictional contact with the bore of the recess of the worm-gear, thus clutching the worm gear to transmission shaft 20, the spring automatically releasing the clutch when pressure upon clutch-rod 27 is removed: 32, a bevel-gear fast with bevel-gear 19: 33, a bevel pinion loose on transmission shaft 20 and engaging bevel gear 19: 34, a bevel pinion loose on transmission shaft 20 and engaging bevel gear 32: 35, a bevel pinion loose on transmission shaft 20 and engaging bevel gear 19 at a point diametrically opposite the engagement of that bevel gear with pinion 33, the hubs of pinions 33, 34 and 35 being provided with clutch-teeth: 36, a clutch splined upon transmission shaft 20 and having clutch teeth adapted to engage with the clutch-teeth of pinion 35: 37, a clutch splined upon the transmission shaft between pinions 33 and 34 and having teeth adapted to engage with the clutch-teeth of either selected one of those two pinions: 38, a lever mounted on casing 14 and adapted to serve in shifting clutch 36 into and out of engagement: 39, a reversing rod connected with lever 38 and leading forward therefrom and adapted for connection with actuating mechanism within reach of the driver of the fire engine: 40, a lever mounted on casing 14 and connected with clutch 37 to serve in shifting that clutch into and out of engagement with pinions 33 and 34: 41, a speed-changing rod connected with lever 40 and leading forward and adapted to be connected with actuated mechanism within reach of the driver of the fire engine: and 42, the housing for the upper end of the inclined transmission shaft, this housing being carried by bracket 10 and being formed as a divided casing to house the worm and worm-gear etc.

It is to be understood that, as before stated, the fire-engine will be provided with the usual adjuncts and accessories belonging to steam fire-engines of the type in question and it is also to be understood that gas engine 11 is to be provided with the necessary accessories usual in connection with gas engines employed in the driving of automobiles.

Assume that the parts illustrated in Figs. 4 and 7 are in the position indicated in those figures of the drawings, and assume that the gas engine is in motion and the fire-engine standing. The gas engine will, through the

medium of the worm, upon its crankshaft, revolve the worm-wheel idly upon the transmission shaft, the worm-wheel turning in the direction indicated by the arrow in Fig. 5. Under these conditions the transmission shaft and all of the parts beyond it will be stationary and idle. If, now, clutch-rod 27 be actuated the clutch-shoes will engage and cause the worm-gear to be clutched to the transmission shaft which becomes driven through the medium of pawls 30. The transmission shaft will now be in motion but no motion will be transmitted to shaft 16 or countershaft 7 for the reason that clutches 37 and 36 are in disengaged position. If rod 41 be now actuated to throw clutch 37 into engagement with pinion 33 motion will be transmitted to shaft 16 and thence, through the differential gear to the countershaft and thence by the sprocket-wheels and chains, to the rear wheels of the fire-engine, thus impelling the fire-engine in the forward direction. The fire-engine will now be moving forward at its lowest rate of speed consistent with the speed of the gas engine. The fire engine, in thus moving forward, may have its two rear wheels turning at different velocities, as in traveling in curves, a result rendered possible by the obvious action of the differential gear. If it be desired to arrest the transmission of power from the gas engine to the traction wheels it may be done by releasing the clutch in the worm-gear or by releasing clutch 37 from pinion 33.

While the fire engine is moving forward at the low rate of speed, incident to the engagement of clutch 37 with pinion 33, that clutch may be shifted from pinion 33 to pinion 34 thus, in an obvious manner, causing the fire engine to advance at a very much increased rate of speed. Clutch 37 therefore serves in controlling the high and low gear forward speed of the fire engine, and it will of course be understood that this clutch may be thrown to either low gear or the high gear position either before or after the clutch in the worm-gear has been thrown into action.

If, while clutch 37 is disengaged from either of its pinions, and while the clutch in the worm-gear is either engaged or disengaged, clutch 36 be thrown into engagement with pinion 35, the rotation of transmission shaft 20 will, in an obvious manner, transmit to the traction wheels a low speed of rotation in backward direction.

If the fire engine should, in advancing, seek to move forward at a speed in excess of that due to the power transmitted to it from the gas engine, as, for instance, in coasting, or stoppage of engine, pawls 30 will, in an obvious manner, permit the transmission shaft to turn at higher rate of speed than the worm-gear. Looking at Fig. 1 it is to be observed that the sprocket chain 9 has a very considerable horizontal stretch, in other words, that there is a very considerable distance between the centers of countershaft 7 and the traction wheels. The rising and falling motion of the general structure relative to the rear axle upon which the rear portion of the general structure is spring-supported, while the motion may be in a modified vertical line, is in sufficiently close approximation to an arc struck from the center of countershaft 7 to prevent any material lengthening and shortening of the transmission chains.

I claim:—

1. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portions of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crank-shaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, transmission mechanism connecting said crankshaft with said countershaft, a clutch interposed in said transmission mechanism to serve in connecting said crank-shaft to and disconnecting it from said countershaft, speed-changing mechanism interposed in the transmission system between the clutch and the countershaft, and a differential gear interposed between the speed-changing mechanism and the countershaft, substantially as set forth.

2. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portions of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crank-shaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler below the level of the frame-girders and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, transmission mechanism connecting said crankshaft with said countershaft, a clutch interposed in said transmission mechanism to serve in connect-

ing said crankshaft to and disconnecting it from said countershaft, speed-changing mechanism interposed in the transmission system between the clutch and the countershaft, and a differential gear interposed between the speed-changing mechanism and the countershaft, substantially as set forth.

3. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portions of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crankshaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, a worm on the projecting portion of said crankshaft, a transmission shaft disposed alongside the boiler, a worm-gear loose on the rear end of the transmission shaft and engaged by said worm, a friction clutch coöperating with said transmission shaft and worm-gear, speed-changing mechanism connecting the forward end of the transmission-shaft with the countershaft, and a differential gear interposed between the speed-changing mechanism and the countershaft, substantially as set forth.

4. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portion of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crank shaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler and below said frame-girders and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, a worm on the projecting portion of said crankshaft, a diagonally disposed transmission shaft disposed alongside the boiler, a worm-gear loose on the rear end of the transmission shaft and engaged by said worm, a friction clutch coöperating with said transmission shaft and worm-gear, speed-changing mechanism connecting the forward end of the transmission-shaft with the countershaft, and a differential gear interposed between the speed-changing mechanism and the countershaft, substantially as set forth.

5. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portions of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crankshaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, a worm on the projecting portion of said crankshaft, a transmission-shaft extending alongside the boiler, a recessed worm-gear loose on the transmission-shaft and engaging said worm, male friction clutch elements carried by the transmission shaft and engaging within the recess of the worm-gear and adapted to serve in connecting the transmission shaft to and disconnecting it from the worm-gear, a jack-shaft mounted near and parallel with the countershaft, diversely sized bevel gears fast on said jack-shaft, a pair of bevel pinions loose on the transmission-shaft and engaging said bevel gears at one side of the axis of the jack-shaft, a bevel pinion loose on said transmission-shaft at the opposite side of the axis of the jack-shaft and engaging the larger of said bevel gears, clutches for connecting either of the bevel pinions with the transmission-shaft, and a differential gear connecting the jack-shaft with the countershaft, substantially as set forth.

6. The combination, with a steam fire-engine having a vertical boiler and frame-girders straddling and secured to the boiler, and a rear axle disposed at the rear of the boiler spring-supported by the rear portions of the frame-girders, and traction-wheels on said rear axle, of a gas-engine secured to the rear of the boiler above the level of the frame-girders and having its crank-shaft projecting beyond the plane of one side of the boiler, a countershaft journaled in bearings at the front of the boiler below the frame-girders and extending endwise beyond the two sides of the boiler, sprocket-wheels fast with the traction-wheels, sprocket-wheels fast on the ends of the countershaft, sprocket-chains connecting the sprocket-wheels of the countershaft and traction-wheels, a jack-shaft mounted near the countershaft, a diagonally disposed transmission-shaft extending alongside the boiler and intersecting the axial line of the

jack-shaft, diversely sized bevel gears on the jack-shaft, a worm-gear loose on the rear end of the transmission shaft and engaging the worm, a friction-clutch serving to connect the transmission-shaft with and disconnect it from the worm-gear, bevel pinions loose on the forward portion of the transmission-shaft and severally engaging the bevel-gears on the jack-shaft, a bevel pinion loose on the transmission-shaft and engaging the larger of said bevel gears, clutches to serve in connecting either of said pinions with the transmission-shaft, and a differential gear connecting the jack-shaft with said countershaft, substantially as set forth.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."