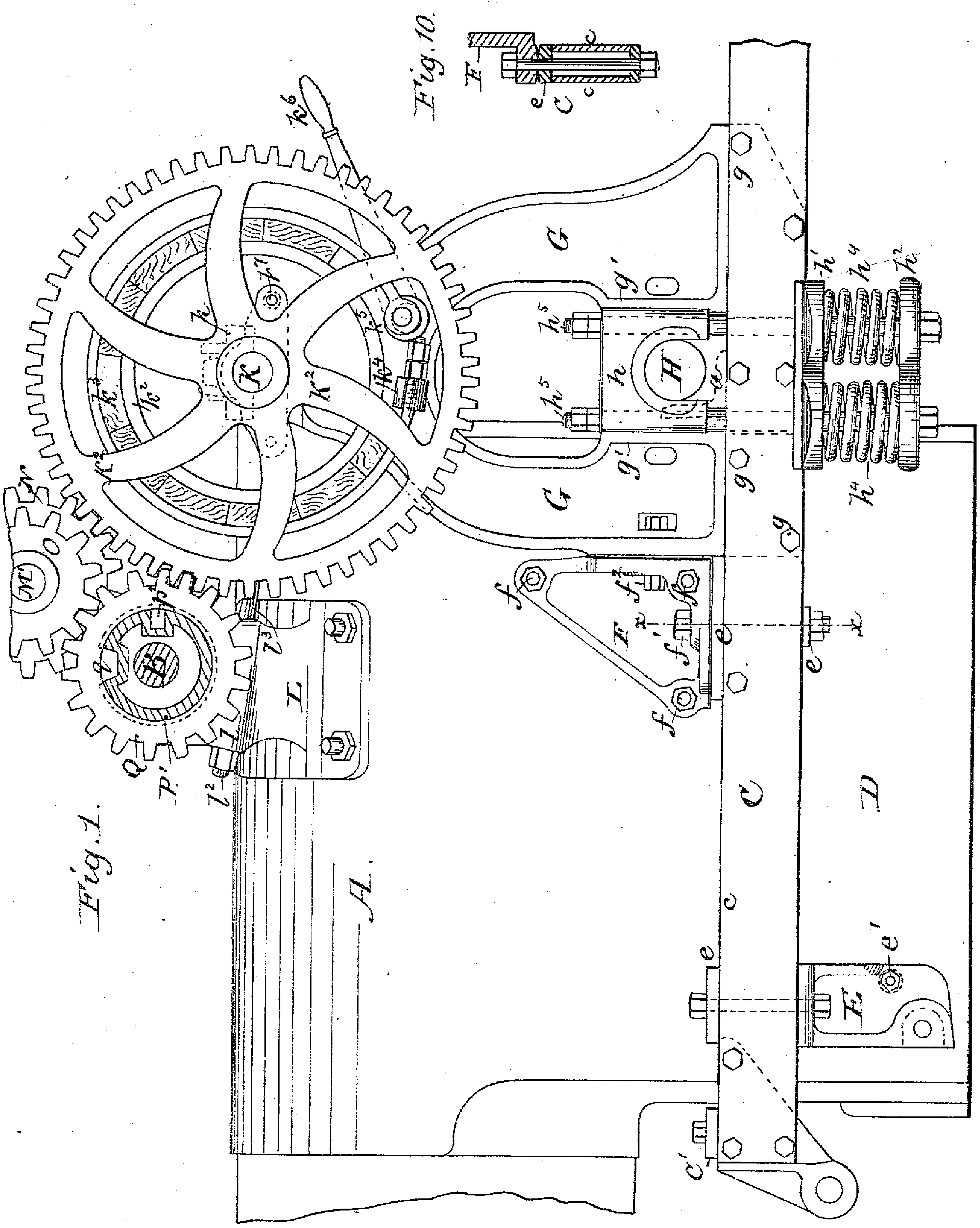
(No Model.) 3 Sheets—Sheet 1.

F. F. LANDIS.

TRACTION ENGINE.

No. 286,313. Patented Oct. 9, 1883.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

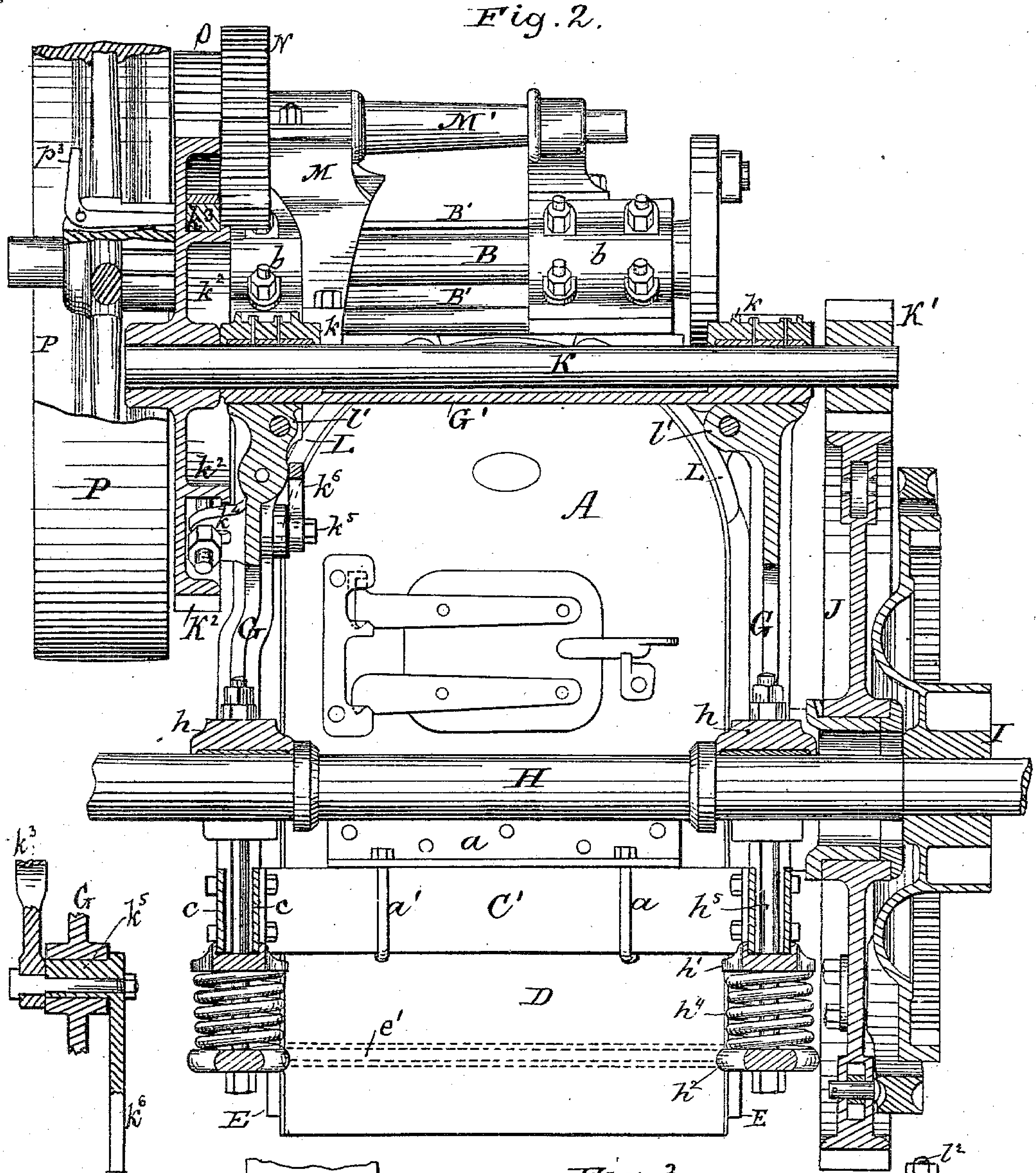

Fig. 3.

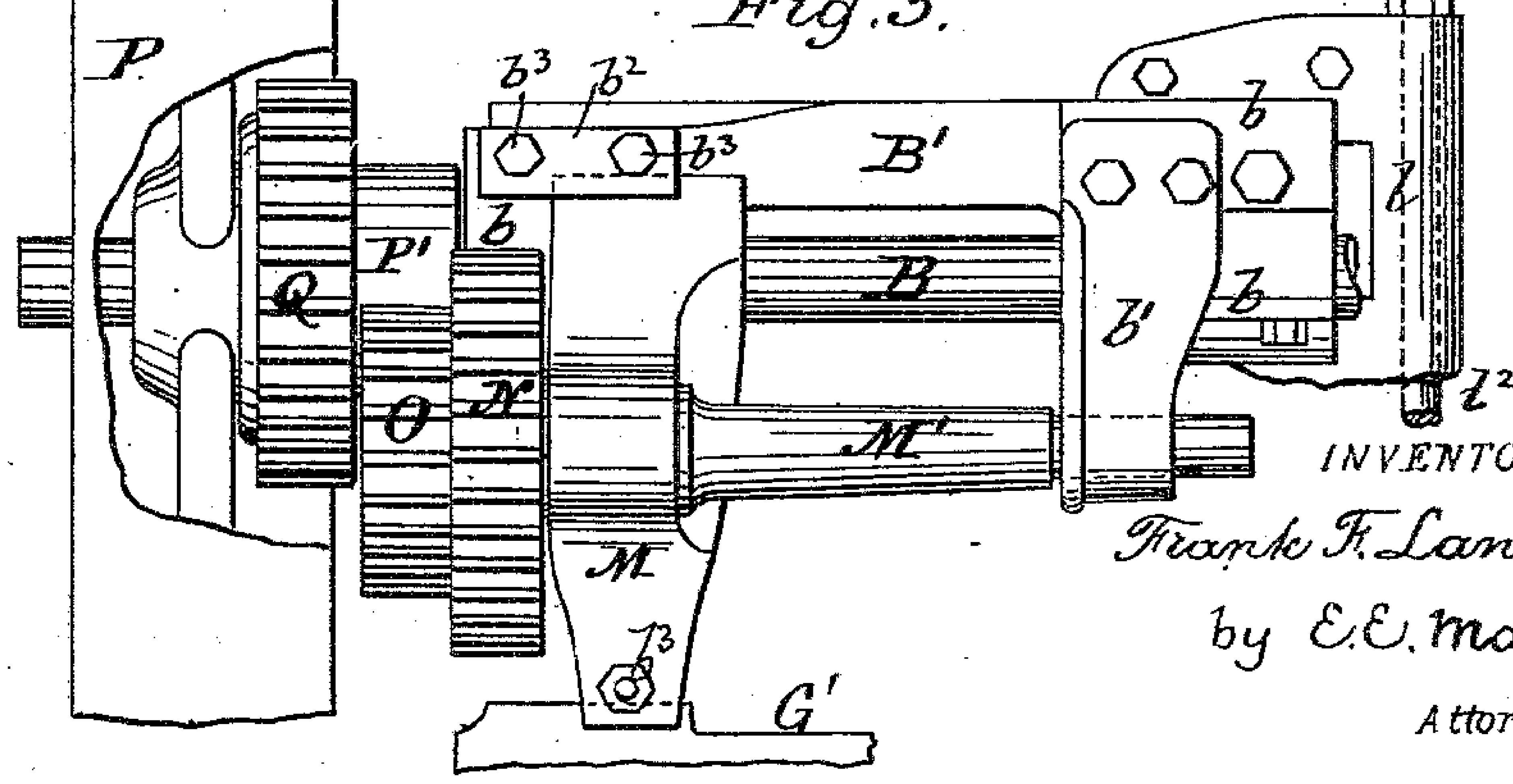

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Fig. 4.

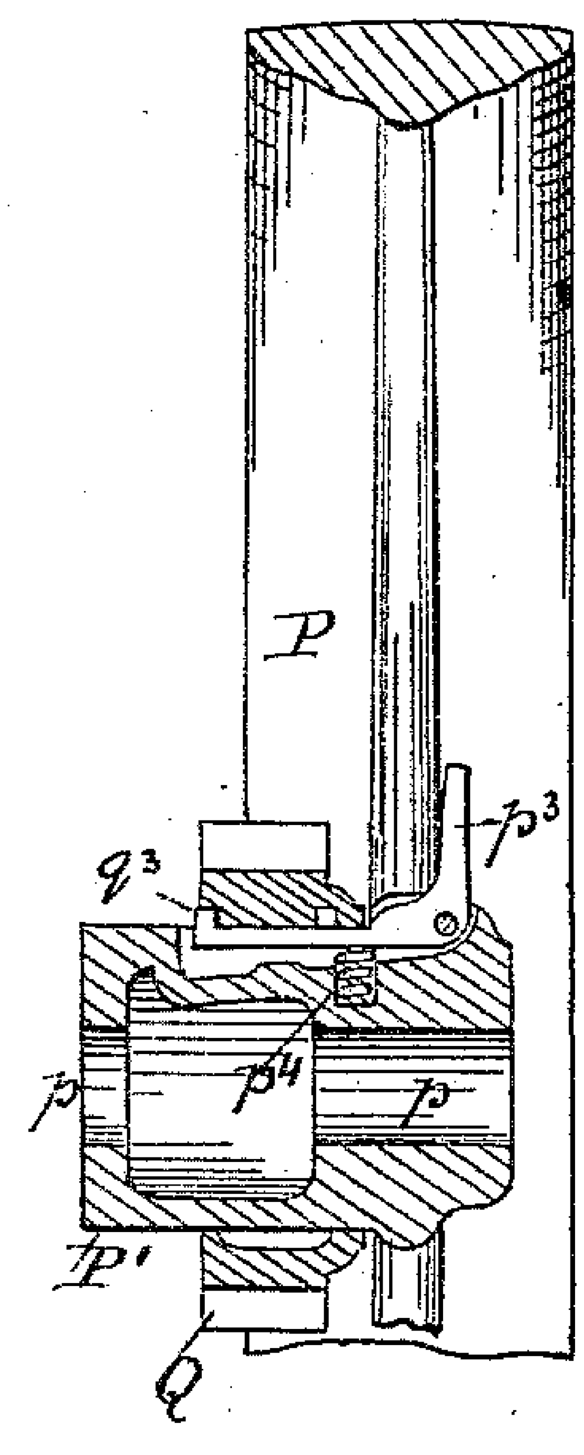


Fig. 5.

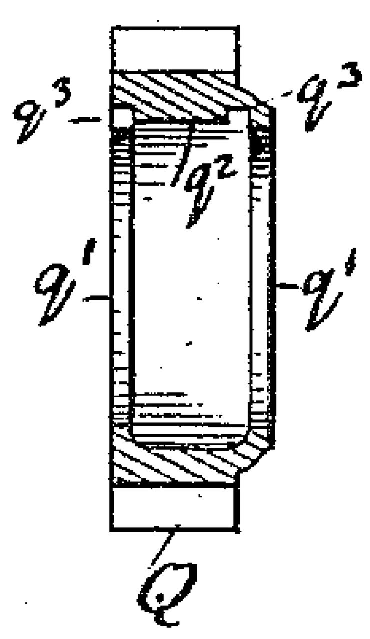


Fig. 6.

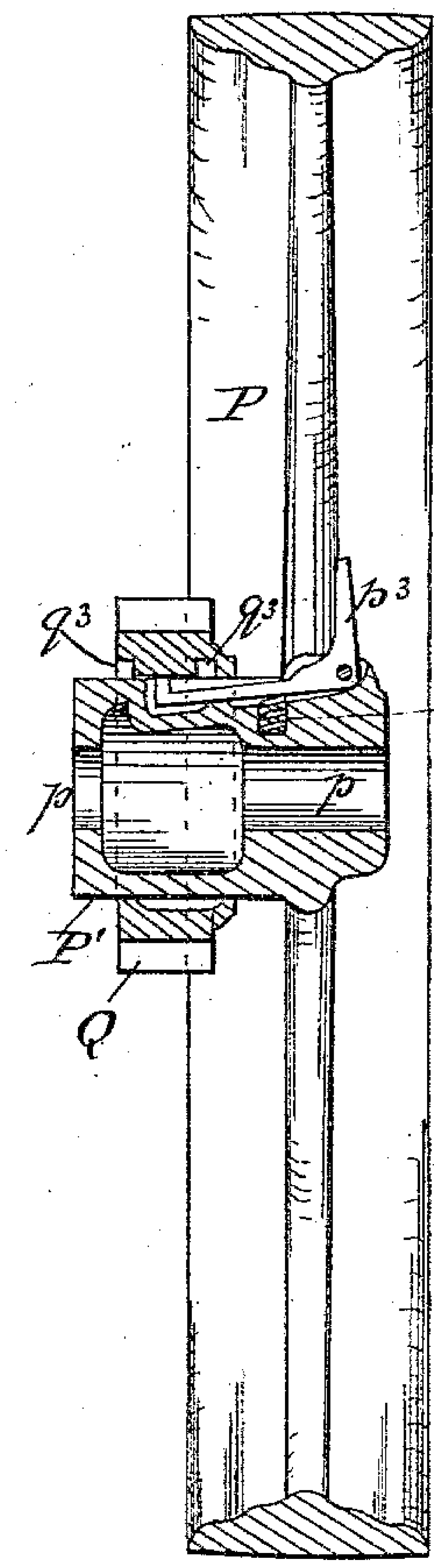


Fig. 7.

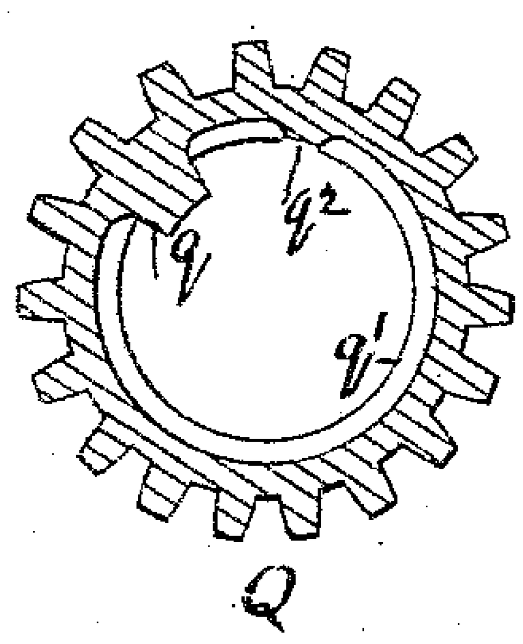


Fig. 8.

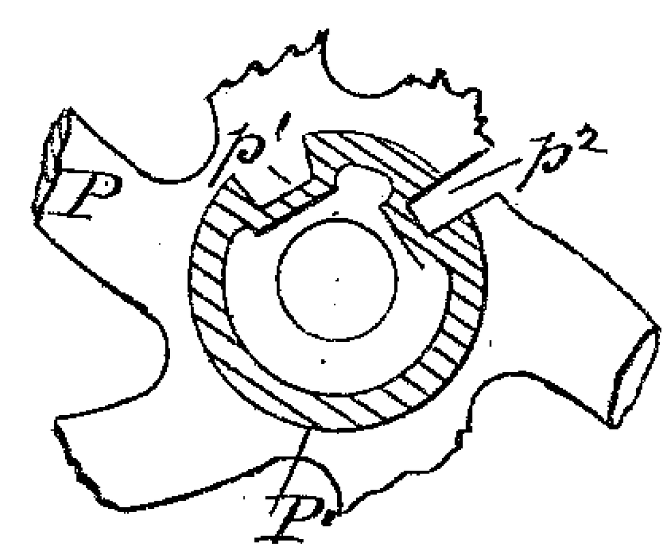
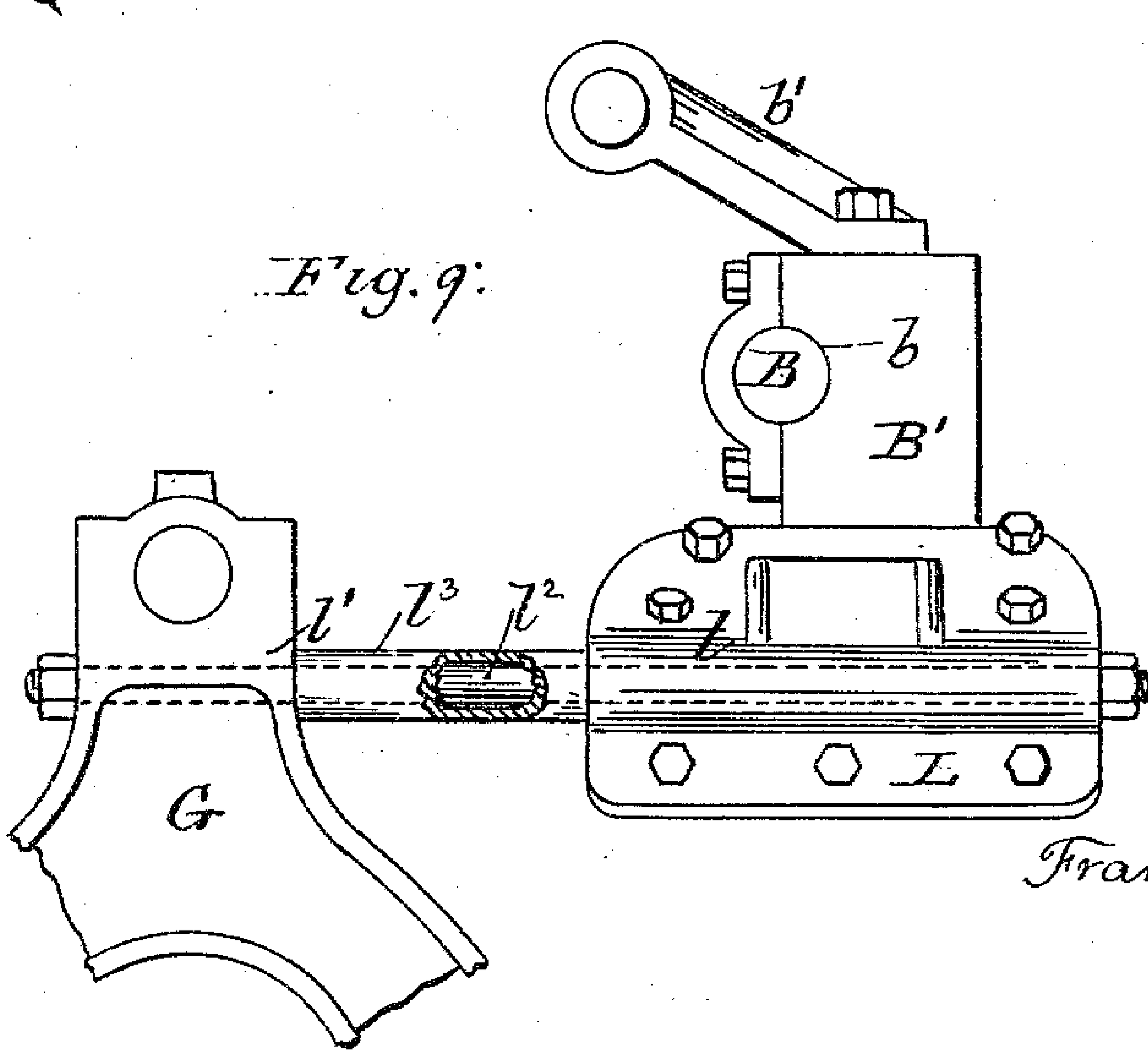


Fig. 9.



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UNITED STATES PATENT OFFICE.

FRANK F. LANDIS, OF WAYNESBOROUGH, PENNSYLVANIA.

TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 286,313, dated October 9, 1883.

Application filed December 11, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANK F. LANDIS, a citizen of the United States of America, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Traction-Engines, of which the following is a specification.

My invention relates to certain improvements in traction-engines, and has for its objects to provide suitable and serviceable means for supporting in operative position the various shafts and gearing employed in such a manner as to relieve, as much as possible, its boiler from undue strain therefrom, and to vary the train of gearing from the motor to the traction devices, so as to utilize said motor in the production of increased speed or power at will, and in the application of the same in like manner, either while the engine is stationary or moving.

Heretofore in constructing a variable train of gear for traction-engines there has been employed an idle-pinion, which, when either a high or a low speed combination was operating, was merely a passive communicator of motion, though producing actively in itself no practical result. In other words, said idle-pinion, when not communicating effective power in the train, has been so located and arranged in the train that it has been necessarily rotated upon its bearing, and the result has been that frequently it, with the adjacent bearings, becomes heated to such a degree as to be bound to its shaft and become an active element in producing the same result as if it were intentionally thrown into gear with the remaining elements of the train. Furthermore, in the arrangement of gearing of traction-engines heretofore employed, insufficient attention has been given to the aptness of the smaller pinion to creep upon the larger and tend to lift the forward end of the boiler, or, at least, subject the same at those points where the motor and adjacent mechanism are secured thereto to undue strain, and this especially when the traction devices are subjected to great or sudden exertions.

Other important and secondary objects of my invention will appear in the following description, and the novel means employed will be specifically set forth in the claims.

Referring to the drawings, Figure 1 is a side elevation of a portion of a traction-engine boiler and its supporting-frame; Fig. 2, a front elevation, partly in section, of the same; Fig. 3, a partial plan of the shifting-gears; Figs. 4 to 8, inclusive, details of one of the shifting-gears connected with the fly-wheel. Fig. 9 is a side view of one of the boiler-saddles and its connections. Fig. 10 is a vertical section on line *x x* of Fig. 1.

Like letters refer to like parts in all the figures.

A represents the boiler, upon which the engine is mounted in the usual location and manner, so as to be connected to the crank-shaft B. I have illustrated so much of the boiler and the manner of supporting the same in the frame-work as is essential to a clear understanding of my present invention, and such frame-work consists of two sills, C, secured to the outer walls of the fire-box of the boiler, and tie-bars C′ at the front and rear. Each side sill, C, is composed of two plates or bars of metal bound together at a short distance apart by bolts *c′* and intermediate tie-bars or sleeves upon the bolts. At the rear end of the boiler a transverse bar, *a*, of angle-iron, is firmly secured, so as to project over and rest upon the cross-sill C′, to which it is fastened somewhat loosely by bolt-hooks *a′*. The front portion of the fire-box is supported at each side by a bracket, E, depending from and secured to the sill C by a bolt passing through a cap-piece, *e*, which rests upon the upper edges of the plates *c c*, which constitute the sill, and down between the plates and through the shelf of the bracket, as clearly shown in Fig. 1. The standard of the bracket is secured to the ash-pan D by a transverse bolt or rod, *e′*, extending from side to side of the ash-pan, and through a tube or sleeve therein, so that when the brackets E on each side are brought to place by tightening the nut of the bolt *e′* the walls of the pan are drawn firmly against the ends of the tube or sleeve, and the brackets firmly against the outer surfaces of the walls, so that the desired transverse firmness and strength in the boiler at this point of support are secured.

It will be noticed that but a single point of attachment—viz., the bolt or rod *e′*—is employed, the object being to provide for a slight relative pivotal action of the boiler and frame-work at the bolt e'; and in furtherance of this object the bearing-surfaces of the cap and the shelf of bracket E may be slightly rounded, as hereinafter more fully described with reference to the bracket F. The lower portion of the standard of bracket E is provided with a socket for connecting the usual reach-rod, which has no bearing upon my present invention, and therefore requires no further description.

F represents a bracket secured to the upper edges of the sills, to the side frames, G, and to the boiler, for the support of the latter, and in the following manner in detail: Three bolts, f, secure the bracket firmly to the boiler, and a bolt, f', passing through the shelf of the bracket and through an upper and a lower cap-piece, e e, serves to secure the bracket to the sill, while another bolt, f^2, passing through the standard of the bracket and into the frame G, serves to secure these parts together. The outer or bearing surfaces of the shelf and standard of the bracket are slightly convexed, and, if desired, the adjacent surfaces of the cap-piece and frame may also be slightly convexed, so that while held firmly together by the bolts there may still be a slight pivotal movement of the bracket against or upon the cap and frame; and to this end only the surfaces of the shelf of the bracket, the cap-piece e, or of only one or both of any of the abovementioned abutting surfaces, may be convex, if preferred, so long as slight pivotal action is attained.

By the construction thus far described it will be noticed that, though strongly secured to the sills and to devices attached thereto, the boiler is yet adapted to slightly oscillate within the frame-work, whereby the shocks and jolting occasioned by obstruction in the path of the traction-wheels are in part, at least, neutralized in their usual effects upon the boiler. The side frames, G, are rigidly secured to the sills by bolts g g, and are connected to each other at the top by a cross-bar, G'. (See Fig. 2.) The central portion of each side frame is cut away to form parallel vertical ways g' g', against which slide the grooved or flanged suspension bearing-blocks h of the traction-axle H.

Passing vertically through the bearing-blocks, and between the plates of the sill, and through cap and base plates h' h^2 and intermediate coil-springs, h^4, are two suspension rods or bolts, h^5, whereby the entire weight of the rear portion of the boiler and its adjacent mechanism is yieldingly supported by the compression of the springs h^4, and due allowance is made for sudden changes in the position of either end of the axle caused by unevenness or obstructions in the track, and the shocks or concussions occasioned thereby are further intercepted and neutralized.

In Fig. 2 I have illustrated in part only one of the traction-wheels operating gear I, connected rigidly to the axle H, and a large gear, J, which is connected to the traction-wheel in such a manner as to rotate the same; but such connection not forming any part of my present invention, being fully described in a companion application, is not more fully shown or described herein, so that for the purposes of this instance any usual means for connecting said gear J to the traction-wheel and the latter to the axle are understood to be employed, such being also capable of permitting variations in the position of the axle at one or both ends from the causes above mentioned.

K is a counter-shaft parallel with the crank-shaft B, and in substantially the same vertical plane with the axle H, and supported in bearings or boxes k k, formed at the ends of the cross-bar G'. A pinion, K', rigidly fixed to the counter-shaft K, meshes with the traction-gear J, and at the opposite end of the counter-shaft a large gear, K^2, is rigidly fixed thereon. Upon the inside of this gear is a friction brake-flange, k^2, about and upon which is a friction-band, k^3, having its internal diameter slightly larger than that of the flange. It is composed of separated blocks of wood secured to a steel or other suitable band, one end of which is secured to the outside of the frame G by being screw-threaded and nutted and passed through a bracket or lug, k^4, while the other end of the friction-band is pivotally secured to an eccentric pin, k^5, which passes through or is journaled in the side frame, and to which is rigidly connected a brake-lever, k^6, located on the inside of the frame and in easy access to the engineer. A spring-pin, k^7, seated in the frame or housing G, and adapted to be projected normally outward, acts to retain the brake-lever in an elevated position.

It is apparent that when the lever k^6 is depressed the eccentric pin is moved, so as to tighten the band upon the flange of the gear K^2, and thus stop its rotation and the advance of the engine, and this result is accomplished by adapting the most effective of all brake mechanism to traction-engines by a construction and arrangement which is at once accessible and compact.

At a suitable distance from the rear end of the boiler, and upon the same, are rigidly secured two saddles, L L, which, in addition to serving as a foundation for the bearings of the crank-shaft B, are also provided with comparatively long perforated lugs l, disposed in line with similar lugs, l', at the upper end of each of the frames G and just beneath the cross-bar G'. Passing through these lugs, and extending one to the other on each side of the boiler, is a threaded stay-rod, l^2, and between the lugs and about the rod l^2 is a sleeve, l^3. Nuts upon the ends of the rod serve to firmly bind the saddles to the frames, and the sleeves being of proper length, the crank and counter-shafts are retained parallel to each other. One of the tie-rods and the lugs through which it passes are inclined, as shown in Fig. 1, while the opposite rod and lugs are horizontal, as shown in Fig. 9, though, if desired, both may be either inclined or horizontal, and the saddles may extend down the sides of the boilers and be provided with a second tie-rod on each side. Now, it being understood that any suitable gearing on the crank-shaft meshing with the gear K^2 completes the means for communicating power from the motor to the ground-wheels, it can be readily seen that these tie-rods, arranged as described, serve an important function, in addition to holding the crank and counter-shaft parallel to each other.

When the motor is operating in traction, and a sudden exertion of power is required to overcome an obstruction on the track, or when ascending a steep grade or drawing a heavy load, and a continuous exertion of great power is required, and when, under any circumstances, heavy work in traction is being accomplished, there is a tendency of the smaller pinion on the crank-shaft to creep upon or over the larger gear on the counter-shaft, and a similar tendency of the smaller pinion on the counter-shaft to creep on the larger gear of the traction-wheel, so that in frequent cases the front end of the boiler, with its truck, is lifted bodily from the ground, the entire apparatus pivoting upon the traction-axle. At such times it is evident that the entire power exerted is expended on the boiler at the point of attachment of the saddles, and without the tie-bolts described, or the equivalent means, injury to the most essential element of the machine occurs, and the same effect of heavy work is present, even when not displayed by such clear evidences as above described. In other words, as heretofore constructed, too slight attention has been given to the fact of the constant and great strain unnecessarily expended upon the boiler. This strain is exerted in two directions: First, when working at ordinary pressure on level ground, the strain is substantially horizontal—that is, equally distributed through all connecting mechanism; and, second, when the work, pressure, and exertion are increased and creeping begins, the direction of strain is at the front. Torsional exertion in the counter-shaft is communicated to the bearings and their supports, and must be successfully resisted in an opposite direction, and thus, in the first instance, the horizontal tie-rods, and, in the second, the inclined tie-rods, effect the designed purpose.

Another of the purposes of my invention is to adapt the machine to meet the changeable requirements as to the amount of power required when in traction, and incidentally provide adaptability to local work. When in traction, circumstances may permit of increase of speed and decrease of power, or may require the opposite. In other words, a practicable traction-engine requires, among other attributes, a simple, effective, variable speed-gearing, and, as heretofore mentioned, such has been essayed.

Referring to Figs. 2 to 8, inclusive, the details of the variable speed mechanism are constructed and arranged as follows:

B′ is a bed-piece bolted to the saddles L L, and is pivoted with boxes b b for the crank-shaft B. The upper surface of the bed-piece B′ is at one end utilized as the point of attachment as a bracket-bearing, b', and at the opposite end as a support for one end of a bridge-bearing, M, which is secured at various positions at will thereon by a clamping-plate or jib, b^2, and bolts b^3, while the opposite end of the bridge M is supported in like manner upon a rear extension of the cross-bar G′ by means of a bolt-hook, b^3.

In the bearings b' and M is a shifting shaft, M′, to which are rigidly secured the pinions N O, the latter being of less diameter than the former.

Upon the crank-shaft B is a fly-wheel, P, the hub P′ of which extends inwardly to and against the bearing b of the shaft. Upon the hub of the fly-wheel P is a third pinion, Q.

Referring particularly to Figs. 4 to 8, inclusive, the hub P′ is finished or turned true to provide a bearing for the pinion Q, and is cast hollow, being finished or bored true at p p for attachment by any usual means rigidly to the crank-shaft B.

In the periphery of the hub are cast or otherwise formed a key-seat, p', and a latch and spring-seat, p^2. The latch p^3 is pivoted to the outer end of the hub, and held normally by the spring p^4, with its hooked end in a raised or locked position. The pinion Q is designed for positive and continuous rotation with the hub, and this is accomplished by having cast or otherwise formed within the bore of this pinion a lug or key, q, which fits the seat, p', formed in the hub. As constructed, the pinion Q is cheaply manufactured, in that it can be cast in one piece, having all the requisite features to meet the requirements of its successful operation.

In a manner well known in the art of casting, not only the outer surfaces are produced, but the inner contour, embracing the inwardly-projecting key q, and the inwardly-projecting angular flanges q' q' and a transverse bridge, q^2, are provided, and to fit the cast pinion to the hub P′ it is only necessary to turn the flanges to fit the same, the key and bridge not requiring exactness in fit or finish. A seat or pocket, q^3, is formed at each end of the bridge to receive the hooked end of the latch p^3, as clearly shown in Fig. 4. By this construction of these parts it is seen that the pinion Q may be shifted upon the hub P′ to and from the end thereof, and at each end of the shift it will be retained by the hooked end of the latch p^3, which, in order to change the position of the pinion, must be depressed against the spring p^4 by pushing inward thereon at the upper end of its projecting vertical arm. Referring back to Figs. 2 and 3, the object and operation of the shifting pinion Q and shifting shaft M may be described as follows:

The purposes of the machine being to perform local work and transient work, it is requisite, first, to be able to operate the motor or engine proper without connection to or operation of the traction mechanism; and, second, to operate the motor when so connected, and with variable effect as to speed and power, as hereinbefore stated. To accomplish the first—that is, local work—the pinion Q is shifted outwardly upon the hub toward the arms of the fly-wheel, and retained in that position by the spring-latch p^3, which rests within the inner seat, q^3, and being a part of the hub P—that is, attached thereto and seated therein—it, as well as the pinion, revolves therewith. Then by loosening the bolts b^3 the bridge M and shaft M′, with its pinions N O, are shifted away from the pinion Q, as clearly shown in Fig. 2, when by tightening the bolts b^3 they are firmly secured in their now entirely disconnected position, and hence, no matter how rapidly the motor or engine is operated, there is not a possibility of communicating motion to the idle-pinion or gear, and thus unintentionally operating the traction mechanism. To meet the second requirement, which may be termed "low speed of traction," the pinion Q is shifted to the inner end of the hub—that is, away from the spokes of the fly-wheel—and secured at that point by the latch p^3, the pinions N O and shifting shaft M′ being retained in their withdrawn position, as when doing local work. Now, power is conveyed from the crank-shaft, through the hub P′ and pinion Q, which meshes directly with gear K^2 on the counter-shaft, and through the pinion K′ thereon, to the traction-gear J, and thence to the ground-wheels. The pinion O, being in line with pinion Q in its present position, meshes therewith, and it and the pinion N are rotated, but idly, as the pinion O does not mesh with the gear K^2, and the pinion N is out of line with the remaining elements of the train. A third combination is also provided for, and it is accomplished by shifting both the pinion Q and the shaft M′ and its pinions outwardly, and securing them as described. In this combination power is conveyed from the crank-shaft through the pinions Q, O, N, and K^2 in the order named, and as shown clearly in Fig. 1, and from thence, by counter-shaft K, through pinion K′, to the traction-gear J; but the speed is increased and the power diminished in contradistinction to the decrease of speed and increase of power resulting from the preceding arrangement of the train. In all of the above combinations the pinion Q never rotates on its bearings, but is carried by the hub of the fly-wheel, and always rigidly secured from longitudinal movement, while the intermediate pinions, N and O, are rigidly fixed in position, and neither of the changeable gears is idly run in such position as to occasion unintentional intermeshing. Various modifications in construction of the several parts of engines may be made without departing from the spirit of my invention. For example, the saddles L L and the bed-piece B′ may be formed in one piece, the bridge-bearing M may be extended to embrace more of the shifting shaft, and the bracket-bearing b' may be omitted. Rubber or other springs may be substituted for the coil-spring h^4, and the suspension-rods h^5 may pass outside or inside or on both sides of the sills, and an angle-iron beam similar to the beam a may be secured to the front end of the fire-box and to a cross-beam of the frame-work; or the beam a may be omitted entirely. The tie-rods l' may be secured to the saddles and frames in other manner than as shown, and shoulders formed on the rods, or nuts placed thereon, may serve the function of the sleeves, and various other similar changes are deemed as comprehended in my invention.

Having described my invention and its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. In a traction-engine, a frame-work arranged about the rear or fire-box portion of the boiler, and connected thereto by brackets and bolts adapted by pivotal bearing-surfaces to permit a slight oscillation of the boiler within the frame-work, substantially as shown and described.

2. In a traction-engine, a frame-work surrounding the fire-box of the boiler, and connected thereto by front side brackets pivotally secured to the boiler, and rear side brackets pivotally secured to the frame-work, substantially as and for the purpose described.

3. In a traction-engine, a rectangular frame-work arranged about the rear or fire-box portion of the boiler, and connected pivotally at the sides by forward-depending brackets pivotally supported upon the frame-work, and a rear end bracket or plate, substantially as shown and described.

4. In a traction-engine, a frame-work arranged at the sides of the fire-box of the boiler, and provided with depending brackets connected to the boiler by a transverse rod passing through the ash-pan and through a sleeve extending across the same, substantially as shown and described.

5. In a traction-engine, a frame-work arranged at the sides of the fire-box of the boiler, and comprising two parallel plates, and depending and supporting brackets secured to the same by a bolt passing through the shelves of the brackets, and through a cap or base plate resting on the edges of the frame-plates, substantially as shown and described.

6. The combination of a traction-engine frame with a supporting-bracket having a shelf provided with a convex bearing-face and adapted to be secured to the frame-work and boiler, substantially as and for the purpose described.

7. In a traction-engine, the combination of the boiler A, ash-pan D, sills C, brackets E, and pivotal bolt e', uniting said brackets, substantially as shown and described.

8. In a traction-engine, a frame-work arranged at the sides of the fire-box of the boiler, and provided with front depending side brackets, rear side supporting-brackets, and side frames secured between the plates of the frame-work, substantially as and for the purposes described.

9. In a traction-engine, saddles secured to the boiler on opposite sides and connected to the side frames by inclined and horizontal tie-rods, in combination with sleeve F^5, substantially as and for the purpose described.

10. In a traction-engine, a counter-shaft gear provided with an inwardly-projecting annular brake-flange, and a brake-band surrounding the same, and secured at one end to the side frame, and at the other end to an eccentric bolt passing through said frame and having a brake-lever rigidly secured thereto, substantially as and for the purpose described.

11. In a traction-engine, the combination of a cross-bar connecting the side frames, and provided with a rearwardly-extending rest, with a bed-piece secured upon the boiler, and provided with a rest and a bridge-bearing adapted to be adjustably secured upon said rest, substantially as shown and described.

12. In a traction-engine, a bed-piece secured upon the boiler and provided with crank-shaft bearings, a bracket-bearing secured to the bed-piece, a bridge-bearing, and a shifting shaft carrying intermediate interchangeable gears, substantially as and for the purpose described.

13. In a traction-engine, the combination of a crank-shaft and a counter-shaft having a gear thereon, with a fly-wheel secured rigidly to the crank-shaft and having a shifting pinion arranged upon its hub, substantially as and for the purpose described.

14. In a traction-engine, a crank-shaft provided with a fly-wheel having a shifting pinion on its hub, a counter-shaft having a gear, and an intermediate shifting shaft provided with pinions of different diameters, substantially as and for the purpose described.

15. In a traction-engine, the combination of a fly-wheel having a hub provided with an external key-seat, with a longitudinally-shifting pinion fitted to the hub and provided with a key, substantially as and for the purpose described.

16. In a traction-engine, a fly-wheel having a hub provided with an external key-seat and latch, and a pinion fitted to the hub and provided with an internal key and latch seats, substantially as shown and described.

17. In a traction-engine, a shifting pinion having bearing-flanges and an internally-projecting key between said flanges, the whole cast in one piece, substantially as and for the purpose described.

18. In a traction-engine, the combination of a wheel having a hub carrying a latch, with a shifting pinion having bearing-flanges and an internal key and latch-bridge with seats, cast in one piece, substantially as and for the purpose described.

19. In a traction-engine, the combination of a boiler fire-box with an angle-iron or bracket rigidly secured to the rear end of said fire-box, and pivotally secured to a cross-sill of the frame-work by rods, substantially as shown and described.

20. In a traction-engine, a brake-controlling device comprising a lever-bearing concentrically seated in a fixed portion of the frame-work, and a friction-band-attaching bolt eccentrically seated in the lever-bearing, substantially as shown and described.

21. In a traction-engine, the combination of a brake-band having one end secured to the housing of said engine and the other to a brake-lever, with the journal-pin of said lever bored eccentrically, and a bolt passing there-through, whereby one end of the brake-band is retained and operated substantially as and for the purpose set forth.

In testimony whereof I affix my signature, in presence of two witnesses, this 4th day of December, 1882.

FRANK F. LANDIS.

Witnesses:
A. B. LANDIS,
F. H. KNIGHT.