

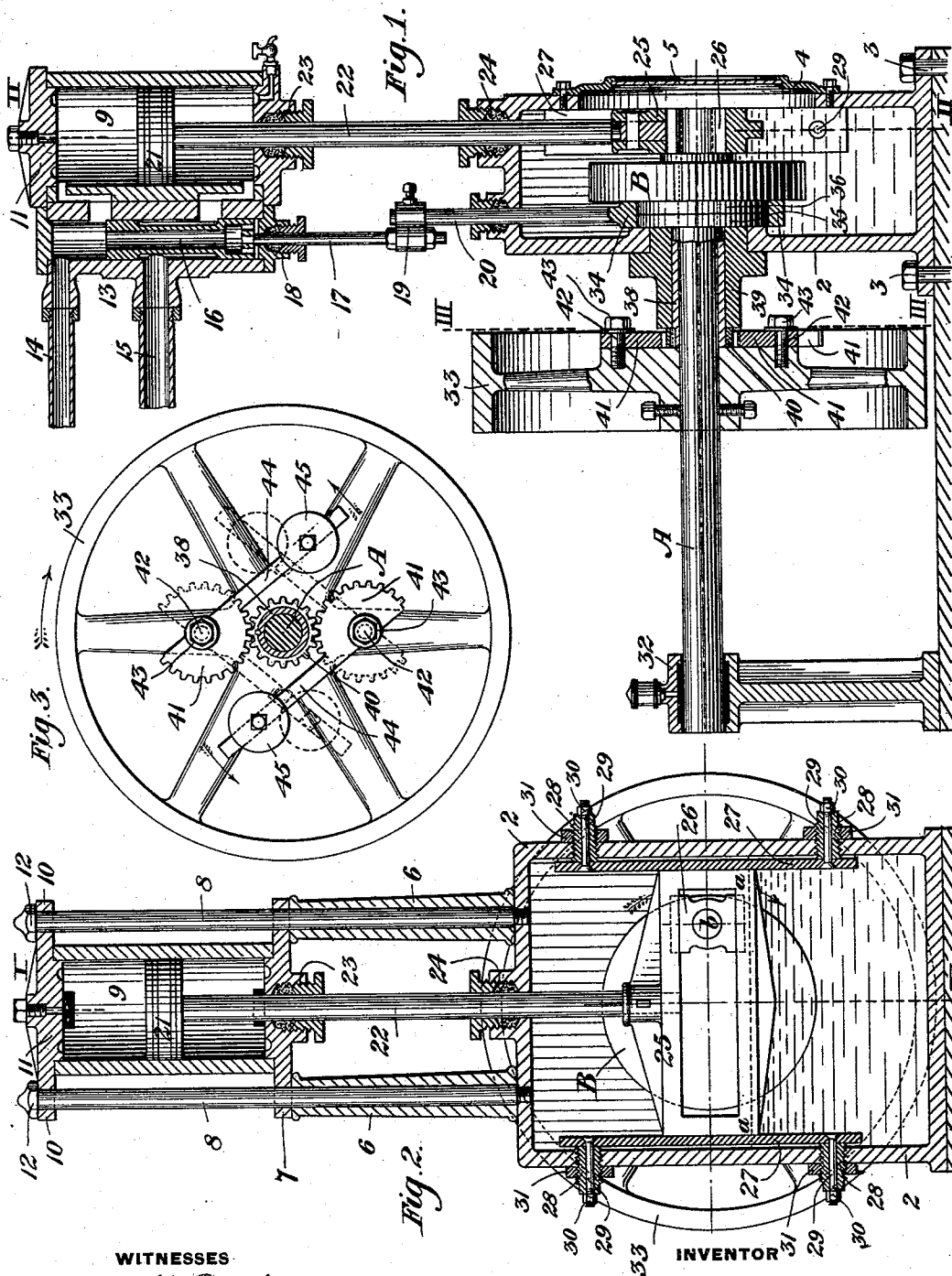
(No Model.)

2 Sheets—Sheet 1.

J. V. EBEL.
GOVERNOR FOR STEAM ENGINES.

No. 536,137.

Patented Mar. 19, 1895.



WITNESSES

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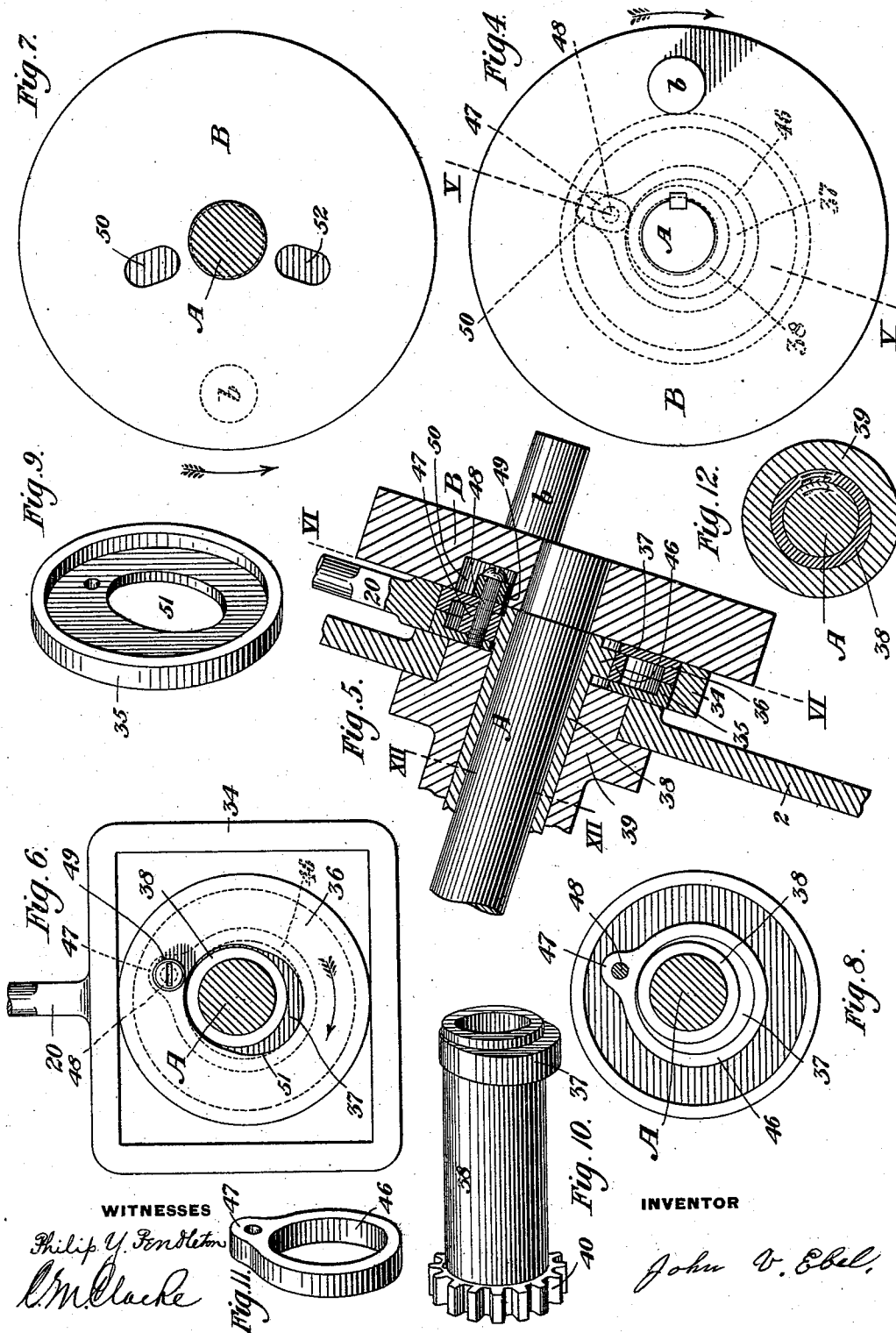
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UNITED STATES PATENT OFFICE.

JOHN V. EBEL, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS
TO GEORGE E. LORCH AND LOUIS LORCH, JR., OF SAME PLACE.

GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 536,137, dated March 19, 1895.

Application filed June 7, 1894. Serial No. 513,769. (No model.)

To all whom it may concern:

Be it known that I, JOHN V. EBEL, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a new and useful Improvement in Governors for Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a vertical sectional view of a steam engine embodying my invention, the section being taken on the line I, I, of Fig. 2. Fig. 2, is a similar section, at right angles to Fig. 1, the section being taken on the line II, II, of Fig. 1. Fig. 3, is a cross sectional view, taken on the line III, III, of Fig. 1, illustrating the actuating mechanism of the governor. Fig. 4, is a face view of the crank disk. Fig. 5, is a sectional view through the crank disk, eccentric and bearing, the section being taken on the line V, V, of Fig. 4. Fig. 6, is a detached detail view of the automatically adjustable eccentric and the surrounding yoke of the eccentric rod. Fig. 7, is a view of the crank disk, similar to Fig. 4, taken from the opposite side, the shaft being shown in section. Fig. 8, is a face view of the interior of the eccentric case, one of the shields being removed, and illustrating the shaft in section, the surrounding hollow spindle, carrying the true eccentric illustrated in Fig. 10, and the eccentric ring attached by a pin to the outer surrounding shields. Fig. 9, is a detail view in perspective of one of the shields or sides of the eccentric case. Fig. 10, is a detail view in perspective of the hollow spindle, showing the manner in which the actuating pinion and true eccentric are constructed. Fig. 11, is a detail view in perspective of the eccentric ring. Fig. 12, is a cross sectional view taken on the line XII, XII, of Fig. 5.

Like numerals and letters of reference refer to like parts wherever used throughout this specification.

My invention consists in an improvement in direct acting steam engines, and has for its object the construction of this class of engines in such a manner as to secure in the highest degree the desirable qualities of simplicity, cheapness, efficiency, and a thorough

lubrication, together with improved means for automatically governing the supply of steam to the valve in a novel and simple manner.

In general, the engine consists of the cylinder and valve chest, rigidly mounted on posts and secured by upright rods passing through the posts and screwed into the lower case, in which are contained the crank disk and valve actuating mechanism; the piston rod and eccentric rod being embraced in stuffing boxes above and below, and making direct connections, while the working parts inclosed in the case revolve in a bath of oil maintained at a fixed level within the oil tight case.

It also consists in certain features of the governing mechanism as shall be hereinafter described and claimed.

Referring now to the drawings, 2, is the oil tight case secured to the foundation by the bolts 3, and provided on its front with the removable plate 4, in which is mounted the glass center 5.

6, 6, are hollow posts, supporting the lower cylinder head 7, and passing through the posts are the upright rods 8, 8, tapped into the top of the lower casing and extending up on either side of the cylinder 9, through lugs 10, on each side of the upper cylinder head 11, and provided at their tops with the nuts 12, 12. The cylinder and its two heads fit closely and when the nuts 12 are turned down, it will be seen that the various parts will be drawn closely and tightly together, forming a very compact, durable, and rigid construction.

Attached to the side of the steam cylinder 9, is the usual valve chest 13, fitted with the supply and exhaust pipes 14, 15, and the balanced valve 16, the stem 17, of which passes down through the stuffing box 18 to the adjustable connection 19, by means of which it is attached to the eccentric rod 20.

21 is the piston, the rod 22 of which makes direct connection to the crank disk B, passing down through the stuffing box 23 in the lower cylinder head and a similar stuffing box 24 located in the upper part of the case 2. Connection with the crank disk B and its pin b is made by means of the horizontal yoke 25, secured to the lower end of the piston rod, carrying the box 26 embracing the pin b, and which is free to slide in the horizontal slot of

the yoke, the connection and its operation being in the manner well understood in devices of this character. The yoke slides against, and is guided in its up and down movement by the slides 27, 27, held against the studs 28 by the countersunk headed bolts 29 and nuts 30, the studs 28 being capable of being set in or out to adjust for wear, and locked by lock nuts 31, which also prevent leakage of the oil. The yoke is further held against lateral movement by bearing against the front inside face of the case and the boss on the crank disk respectively. The chamber formed in the inside of the case is kept full of oil up to the line *a, a*, thus insuring thorough lubrication of all the parts inside the case.

A is the main shaft of the engine, bearing in the pillow block 32 and to which is rigidly secured the pulley wheel 33.

I shall now describe the automatic governor and the means for actuating it.

As has already been described, the valve stem 17 is adjustably connected to the eccentric rod 20, carrying a yoke 34 which embraces the eccentric case and is operated thereby. The eccentric case consists of two halves 35 and 36, surrounding the eccentric proper 37, and by which the relation of the centers of the eccentric case to the center of the shaft, is regulated. When in position, as shown in the drawings, this case is also maintained against lateral movement by bearing against the crank disk and side of the chamber respectively. The true eccentric 37 is formed integral with the hollow sleeve 38, surrounding the shaft A, supported within the bearing 39, which is bolted to the sides of the chamber 2, and extending beyond it and furnished with the pinion 40, keyed on.

41, 41, are segmental pinions pivotally attached at 42 to arms of the pulley wheel 33 by bolts 43, and having outwardly extending arms 44 fitted with adjustable weights 45. The segmental pinions 41 are in mesh with the pinion 40, and when, by reason of the motion transmitted through the centrifugal action of the weights in the well known manner of this class of governors, the segmental pinions will cause the pinion 40 to revolve on the shaft A, and, when set as shown in Fig. 3 of the drawings, the wheel revolving as indicated by the arrow, the pinion, and consequently the spindle, will be caused to move upon the shaft in the direction indicated by the double arrows in Fig. 12.

As clearly shown in the various views, the eccentric is formed integral with the spindle and will of course move in exact proportion to the motion of the pinion. It is surrounded by the closely fitting ring 46 provided at one end with the lug 47, through which passes the screw 48 connecting the ring with the two outer shields in such a manner that motion of the eccentric will be transmitted to them. On the outer end of the screw 48, is mounted a roller 49, the purpose of which is to maintain the pivotal connection of the eccentric,

ring 46, and the shields in an axial line, and for this purpose the groove 50 is cut in the crank disk, as shown. Thus it will be seen, that, whatever the position of the eccentric, relative to the center of the shaft may be, the roller can only move from or toward the true center in a straight line, and clearance is left at 51 in the shields to admit of the greatest travel, the sides of the opening 51 being parallel and closely adjacent to the outside of the spindle 38 at each side of the eccentric 37, thus aiding in guiding the motion of the eccentric shields 35 and 36. It will be evident, also, that motion of the crank disk will be transmitted, by means of the side of the slot bearing against the roller, to the eccentric case, and it will operate in all respects on the yoke and eccentric rod, in the same manner as an ordinary eccentric. Thus, when the weights 45 are thrown out, due to increased speed of the engine, the throw of the eccentric will be proportionately lessened, resulting in decreased travel of the valve and quicker cut-off.

A return of the various operative parts to a normal position is secured in a novel and highly effective manner.

Referring to Fig. 12, it will be seen that when the spindle is revolving in the direction of the double arrows, within the stationary bearing 39, there will be a constant friction tending to retard the revolution of the spindle and operating through the pinion 40 on the segmental pinions 41 and weights 45, will cause them to seek to return to their normal position as soon as the reduced speed of the engine will allow such frictional effect to overcome the centrifugal action of the weights. Inasmuch as the entire weight of the shaft and pulley with its accompanying parts is borne by the hollow spindle 38 resting in the bearing 39, this frictional contact will be considerable, and will tend to increase the binding action on the spindle, and to return the weights to their normal position. By setting the weights in or out, the desired speed of the engine may be readily regulated. I am thus enabled to dispense with the usual springs commonly employed on governors of this class, as I have found the engine to give most satisfactory results when constructed and operated as I have described.

When it is desired to reverse the engine, all that is necessary is to take out the bolts 43, reverse the segmental pinions 41 when they will assume the position indicated by dotted lines in Fig. 3; and to change the roller from the slot 50 in the crank disk to the corresponding slot 52, shown in Fig. 7, the relation of both slots to the crank pin should be the same, and their position, in regard to it will regulate the point of cut-off of the steam.

Changes and modifications may be made in the location and arrangement of parts by the skilled mechanic without departing from my invention, as for instance, the eccentric and case may be located outside the chamber of

the engine, it being only necessary that the spindle should revolve in a fixed bearing, in order to accomplish the desired result of counteracting the effect of centrifugal action on the weights and returning them to a normal position. The improved governor may be applied as well to a horizontal or other type of engine where the conditions are equally favorable, with as good results as I have found in the type I have illustrated. It has been found in practice to give the results sought for, in a highly successful and beneficial manner; is capable of developing the highest efficiency of the steam, and furthermore, the engine is very simple, of few parts and not liable to get out of order. It is easy and cheap to construct and keep in repair, and requires little or no attention for lubricating.

Having described my invention and in what manner it operates, what I claim, and desire to secure by Letters Patent, is—

1. In a steam engine, a hollow spindle surrounding the main shaft and inclosed within a fixed bearing capable of being revolved on the main shaft by centrifugally controlled segmental gearing, pivoted to the driving wheel, carrying weighted arms and in mesh with gear teeth at one end of the hollow spindle, the spindle being retarded by friction against the inside of the fixed bearing, in combination with an eccentric valve operating mechanism, surrounding an eccentric forming a part of the hollow spindle and connected by an eccentric rod with the valve, substantially as shown and described.

2. In a steam engine, steam supply governing mechanism consisting of a centrifugally controlled hollow spindle, surrounding the

main shaft and inclosed within a fixed bearing, provided with an eccentric inclosed in a ring having a lug, through which passes a pin securing the lug to outer surrounding circular halves constituting a wheel capable of being set eccentric to the true center of the shaft, by the rotation of the spindle and eccentric, and mounted internally within a yoke attached to the valve rod of the valve, the halves of the wheel having elongated apertures surrounding the spindle and allowing of adjustment relative thereto, and the pin constituting a screw, tapped into one of the halves and being provided at the other end with a roller which enters a radial slot in the crank disk, and is capable of being revolved thereby, substantially as shown and described.

3. In a steam engine, toothed wheels, or segments of wheels, pivotally attached to arms of a wheel secured to the main shaft, provided with weighted arms, capable of rotation due to centrifugal force, meshing into a pinion on one end of a hollow spindle surrounding the main shaft and inclosed within a fixed bearing, the spindle being provided at the other end with an eccentric adapted to transmit motion to the valve; the outward motion of the weighted arms being reversed by friction of the outside of the hollow spindle against the interior of the fixed bearing, without the aid of retracting springs substantially as shown and described.

In testimony whereof I have hereunto set my hand this 28th day of March, 1894.

JOHN V. EBEL.

Witnesses:

PHILIP Y. PENDLETON,
C. M. CLARKE.