

(No Model.)

2 Sheets—Sheet 1.

O. ABRAHAM.
STEAM ENGINE.

No. 568,555.

Patented Sept. 29, 1896.

Fig. 1.

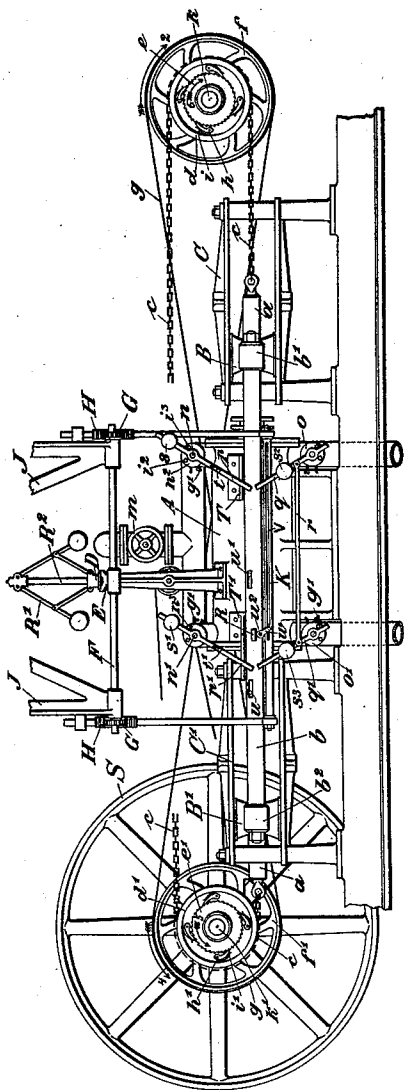
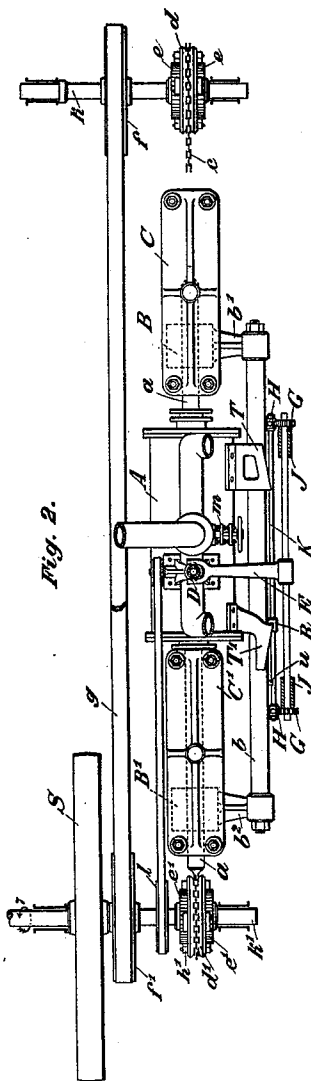


Fig. 2.



Witnesses
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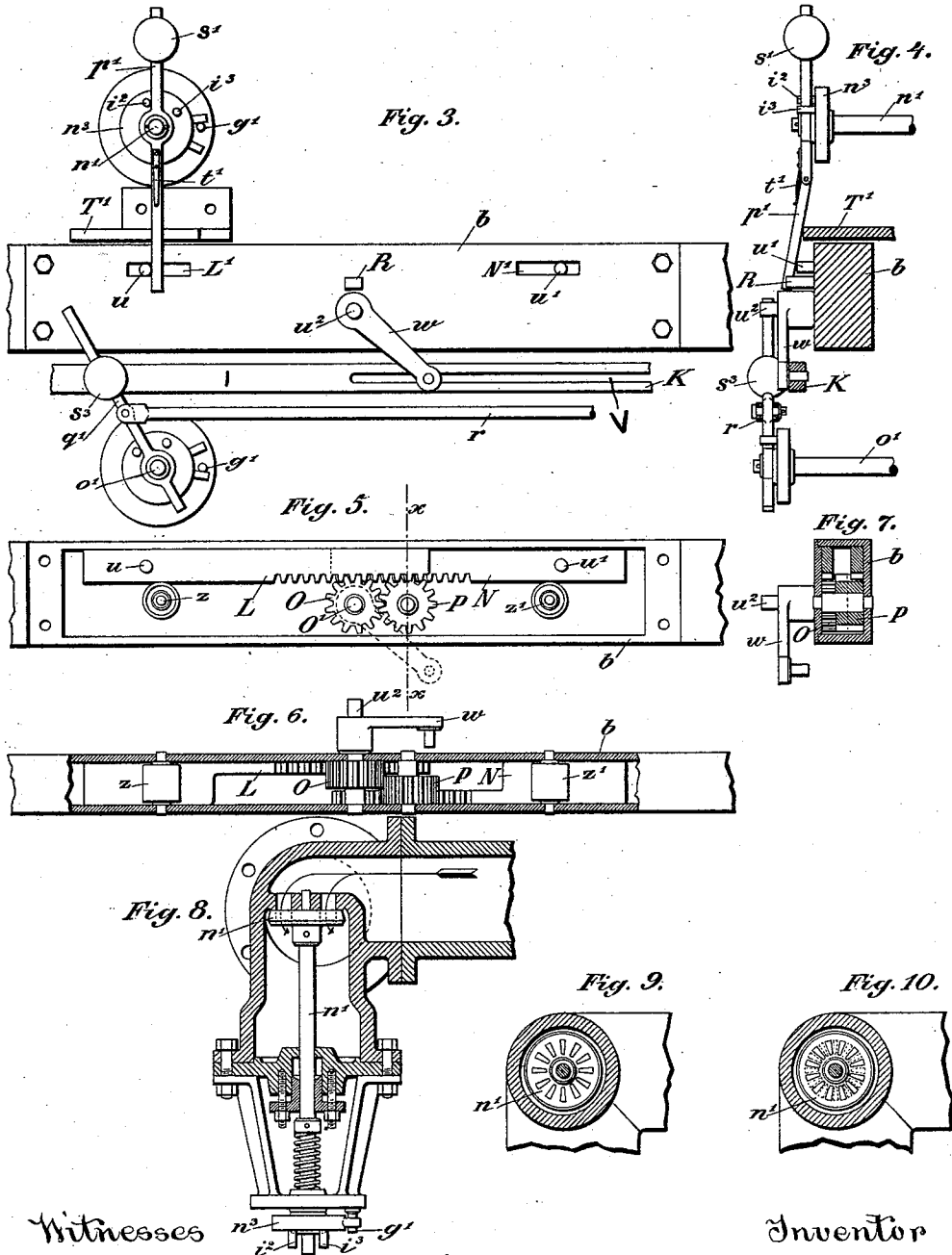
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UNITED STATES PATENT OFFICE.

OTTO ABRAHAM, OF PLATKOW, GERMANY.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 568,555, dated September 29, 1896.

Application filed October 14, 1895. Serial No. 565,606. (No model.) Patented in Belgium July 15, 1895, No. 116,399; in England October 26, 1895, No. 17,684, and in Germany April 15, 1896, No. 87,143.

To all whom it may concern:

Be it known that I, OTTO ABRAHAM, a subject of the King of Prussia, Emperor of Germany, residing at Platkow, in the Kingdom of Prussia and German Empire, have invented certain new and useful Improvements in Steam-Engines, (for which I have received Letters Patent in the following countries: Germany, No. 87,143, dated April 15, 1896; Belgium, No. 116,399, dated July 15, 1895, and England, No. 17,684, dated October 26, 1895,) of which the following is a specification.

The present invention relates to improvements in steam-engines; and its object is to attain a high development of power with a minimum consumption of steam.

On the annexed drawings the principle of the invention is shown.

Figure 1 is a complete view of a steam-engine fitted with the improvements referred to. Fig. 2 is a plan view of Fig. 1; and Figs. 3 to 6, inclusive, show details.

The piston-rod *a* is provided with two cross-heads *B B'*, sliding in the guides *C C'*. The cross-heads are connected to the slide-valve rod *b* by means of suitable stays *b' b''*, so that the former (*b*) follows the motion of the piston-rod *a*. A large pin *R* is fixed to the slide-valve rod *b*, about midway thereof. Two smaller pins *u u'* are fixed on both sides of the large pin, and a third pin *u''* is fixed underneath pin *R* and is journaled within the rod. A lever *w* is secured to pin *n''*, so as to move therewith, and has a projection adapted to slide in a horizontal slot *V*, formed in the guide *K*. Said slot has its ends connected to rods *H*, which are provided with racks.

Toothed wheels *G*, which are keyed to a shaft *F*, journaled in the bearings *J*, gear in the racks. A lever *E* clasps around the shaft *F*, which is in connection with a sleeve *D*, the latter sliding on the governor-rod *R''* of the governor *R'* and moving under the influence of the balls of the latter. The governor receives its motion from the shaft *k'* by means of the pulley *l*.

On either side of the cylinder *A* are situated the inlet-valves *n* and *n'*, as also the outlet-valves *o* and *o'*. The inlet-valves are pro-

vided with disks *n'' n'''*, which are under the influence of the levers *p p'* and serve to open or close the valves. The motion of the disks is limited by stops *g'*, and the levers *p p'* can only move on the disks between the stop-pins *i' i''*. The levers *p p'* are formed of two parts. The lower parts of same are under the influence of the springs *t t'*. The inlet-valve *n'* is open, as represented in Fig. 1, while valve *n* is closed. When the piston and with it the rod *b* moves, the pin *u* strikes against the lever *p'* and pushes the same into the position shown in Fig. 3. In this position the lever tips over, by means of the counterweight *s'*, which is secured on the upper part thereof, until it reaches the pin *L''* and also moves the disks between the stop-pins *g'*, thus suddenly closing the valve *n'*. Actuated by the spring *t'*, the lower part of the lever *p'* is forced onto a wedge *T'*, which is attached to the cylinder, and the pin *u* can slide under the lever *p'* without impediment. During the further motion of the slide-valve rod the pin *u'* of the valve *n* passes the lever *p*. The lower part of the lever *p*, being also under the pressure of a spring *t*, has slid up onto the wedge *T* and allows the pin *u'* to pass freely. Now the larger pin *R* strikes against the lever, catches the same, and opens the inlet-valve *n* by means of the counterweight, which is attached to the lever *p*. The opening of this valve is just as sudden as the closing of the valve *n'*, as the valve *n* is provided with the same kind of stop-pins as the valve *n'*. Through the opening of the valve *n* the piston is moved back again and causes the pin *u'* to strike against the lever *p*, thus forcing the latter onto the wedge *T*. The pin *u* now passes under the lever *p'*, while the pin *R* catches the lever *p'*, thus again opening the valve *n'*. These movements continue in this manner. The supply of steam is obtained from the boiler by means of the main steam-valve *m*.

The two outlet-valves *o* and *o'*, which are coupled together by the rod *r*, are worked by the pin *u''*, which is situated under the large pin *R*. Both outlet-valves are fitted with the same appliances as the inlet-valves, but with the difference that the levers *q q'* are not hinged. As shown in Figs. 1 and 3, the out-

let-valve o is open when the valve o' is closed. Consequently as soon as the pin R arrives at the position in which it opens the inlet-valve n then the pin u^2 closes the outlet-valve o , and the latter in its turn opens the outlet-valve o' by means of the rod r . The levers q q' are provided with counterweights s^2 s^3 , which cause a sudden opening and shutting of the outlet-valves in the same manner as with the inlet-valves.

The governing of the machine is also effected by the slide-valve rod b , that is to say, by the following parts: The pins u and u' , which serve to actuate the inlet-valves, are fitted movably in the grooves L N' . The pin u is fixed together with the rack L , which is situated in the interior of the slide-valve rod b . A shaft O' , whose end forms pin n^2 , is journaled in the valve-rod and carries a cog-wheel O , which gears with rack L , and a second cog-wheel P , which in turn gears in another rack N . To this rack the pin u' is fixed. The racks N and L are supported on their ends by idle-rolls z z' . Thus the pins u and u' are under the influence of the motion of the lever w . Now the governor receives its rotary motion from the main shaft, or, as illustrated, from the shaft k' , and transfers its motion to the sleeve D and thus to the lever E . The latter sets the shaft F in motion, and consequently the cog-wheels G . The result is that the racks are shifted either upward or downward, and with them the guide K , which operates the lever w . By the shifting of the lever w the pins u u' are either forced asunder or brought near each other, thus regulating the opening and shutting of the inlet-valves.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a device of the character described, a cylinder, a piston-rod, a valve-rod connected to the piston-rod, pins slidable on said valve-rod, levers governing inlet and outlet valves and operated by the pins and means for adjusting the distance between the pins, as and for the purpose described.

2. In a device of the character described,

a cylinder, a piston-rod working therein, a valve-rod connected to the piston-rod, an inlet and outlet valve for each end of the cylinder, a spring-pressed hinged stem on each inlet-valve, a stem on each outlet-valve, a cam-plate beneath each hinged stem, pins on the valve-rod adapted to engage the hinged stems and carry them onto the cam until out of engagement, a lug on the valve-rod adapted to release the stems from the cams after the pin has passed back to its normal position and another pin on the valve-rod adapted to open and close the outlet-valves by engaging their stems, as and for the purpose described.

3. In a device of the character described, a cylinder, a piston-rod working therein, a valve-rod connected to the piston-rod, an inlet and an outlet valve for each end of the cylinder, a spring-pressed hinged lever operating each inlet-valve, a lever operating each outlet-valve, a rod connecting the outlet-valve levers, a cam-plate beneath each hinged lever, pins slidable in the valve-rod and adapted to slide the hinged levers onto the cam-plates, rack-bars to which said pins are secured, located within the valve-rod, a lug on the valve-rod to release the levers from the cam-plates, a pin on the valve-rod to actuate the outlet-valve levers, cog-wheels journaled in the valve-rod to mesh with the rack-bars and each other, a lever carrying a pin and connected to the shaft of one of said cog-wheels, a guide-plate having a slot in which said lever-pin is adapted to travel, rack-rods supporting said guide-rod, a shaft carrying pinions to mesh with the rack-rods, a governor operated by the engine adapted to actuate an arm on the shaft whereby the rack-rods are operated and carry with them the guide-plate which causes the lever connected therewith to turn and operate the cogs and rack-bars, thereby shifting the position of the pins which are secured thereon so as to regulate the inlet-valves, as and for the purpose described.

In testimony whereof I hereunto set my hand in presence of two witnesses.

OTTO ABRAHAM.

Witnesses:

FERDINAND KLASTERMANN,
FERDINAND BORNHAGEN.