

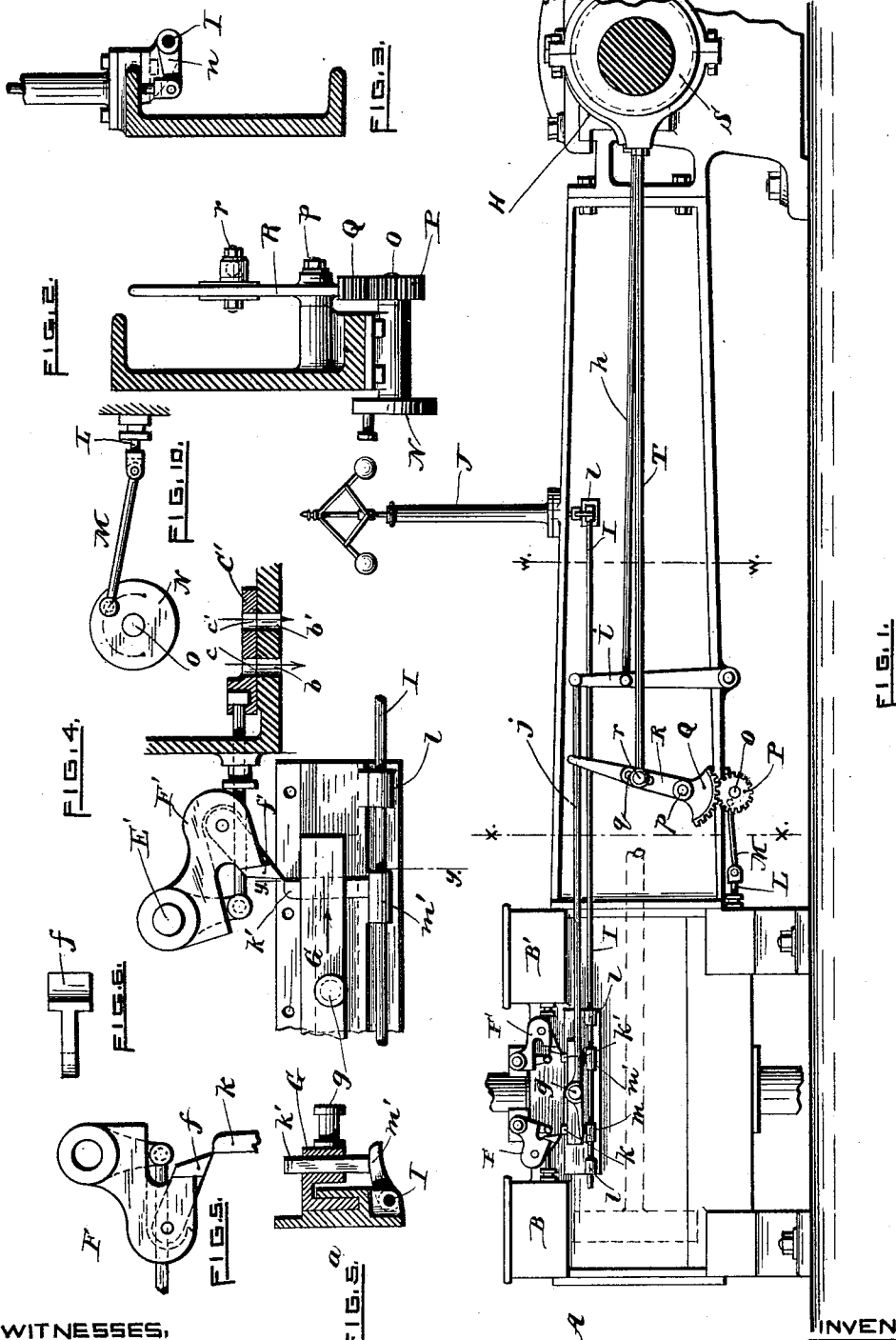
(No Model.)

2 Sheets—Sheet 1.

N. T. GREENE.
VALVE GEAR FOR STEAM ENGINES.

No. 389,146.

Patented Sept. 4, 1888.



WITNESSES:

H. de Thurston
A. J. Murphy

INVENTOR.

Noble T. Greene

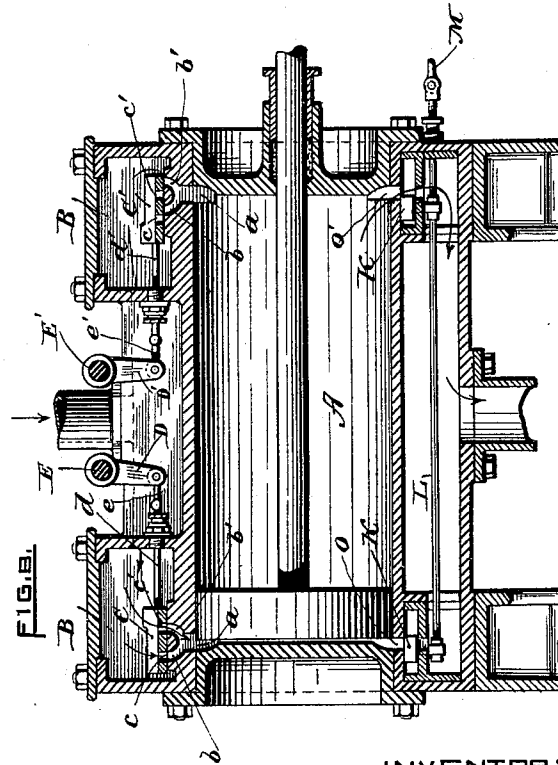
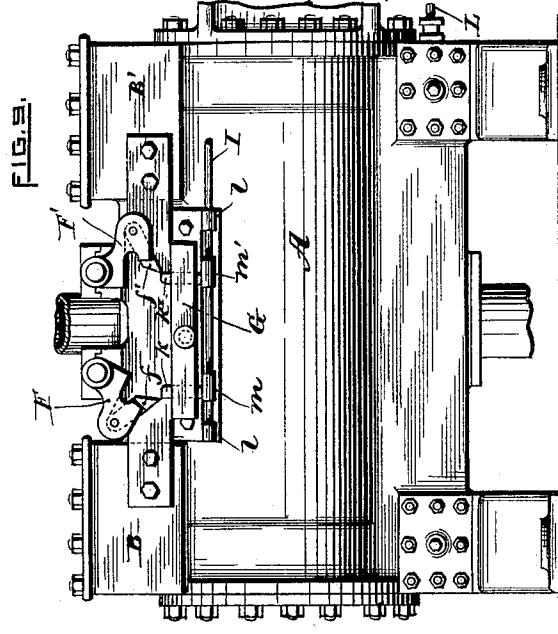
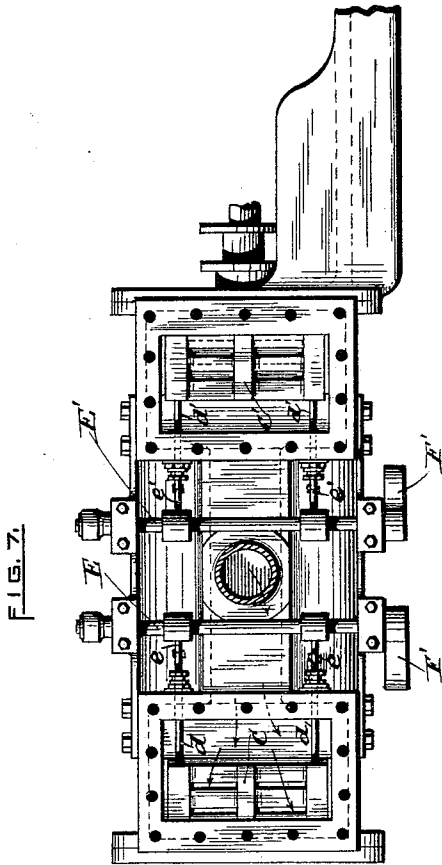
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UNITED STATES PATENT OFFICE.

NOBLE T. GREENE, OF PROVIDENCE, RHODE ISLAND.

VALVE-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 389,146, dated September 4, 1888.

Application filed March 17, 1888. Serial No. 267,446. (No model.)

To all whom it may concern:

Be it known that I, NOBLE T. GREENE, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Valve-Gears for Steam-Engines; and I do hereby declare that the following specification, taken in connection with the accompanying drawings, forming a part of the same, is a full, clear, and exact description thereof.

The improvements hereinafter described relate to the valve-gear for the steam-valves of the engine and the means for operating and regulating the same.

The invention has for its object to secure a more sensitive and perfect regulation of the engine than has been heretofore attainable; and it consists in the arrangement of devices for effecting such regulation, hereinafter described.

Referring to the accompanying drawings, Figure 1 is a side elevation of the engine, showing the working parts. Fig. 2 is an enlarged transverse section taken on the line *xx* of Fig. 1. Fig. 3 is an enlarged transverse section taken on the line *ww* of Fig. 1. Fig. 4 is a front view of a portion of the steam-valve gear, with the valve in section. Fig. 5 is a front view of a portion of the steam-valve gear, showing the parts in a different position. Fig. 5^a is a section on the line *yy* of Fig. 4. Fig. 6 is a detail representing the pivoted latch. Fig. 7 is a plan view of the cylinder with the bonnets of the steam-chests removed, and showing the valves and valve-connections. Fig. 8 is a longitudinal section of the cylinder, showing the steam and exhaust valves and their connections. Fig. 9 is a side elevation of the cylinder, showing the steam-valve gear. Fig. 10 is a side view of a portion of the exhaust-valve gear.

The general construction of the engine represented in the drawings is that of a well-known type, shown and described in the Letters Patent granted to me March 13, 1855, No. 12,507, and the main features, including the frame, the main shaft, the eccentrics thereon, the cylinder, steam-chest, ports, valves, &c., are of the ordinary form and need not be here described in detail.

Referring particularly to those parts with

which the present improvements are more closely connected, A is the cylinder, with its steam-chests B B', one at each end of the cylinder.

C C' are the steam-valves, which are of the gridiron variety, and which are represented in the drawings as being each provided with two ports, *c c'*, communicating with two corresponding ports, *b b'*, in the cylinder, said two ports *b b'* uniting to form the port *a*, as clearly shown in Fig. 8. The valves C C' are provided with the usual valve-stems, *d d'*, projecting through proper stuffing-boxes in the steam-chests, and connected by means of suitable links, *e e'*, with the arms D D' upon the rock-shafts E E', so that the rocking of said shafts will serve to slide the valves and open and close the ports in the usual way.

As the improvement hereinafter described relates solely to the means for opening the valves, it has not been deemed necessary to represent in the drawings the means for closing the valves; but it is to be understood that the valves are to be closed by weights or springs operatively connected to the rock-shafts E E' in the usual manner.

The means which I employ for opening the valves are as follows: To the forward ends of the rock-shafts E E' are attached the rock-arms F F', as shown in Figs. 1 and 9, said rock-arms being provided with pivoted or swinging latches *f f'*. (More clearly shown in Figs. 4 and 5.) Mounted in suitable standards is the sliding bar G, to which the proper longitudinal motion is given by means of the eccentric H on the main shaft, the eccentric-rod *h*, lever *i*, and rod *j*, connecting with the stud *g* on the sliding bar. In suitable mortises in the sliding bar G are arranged two tappets, *k k'*, fitted to work freely therein in a direction at right angles to the length of the sliding bar, substantially as shown in my former patent, No. 12,507.

Below the sliding bar G is arranged the rock-shaft I, mounted in suitable bearings, *l l*. This rock-shaft I is provided with toes or lifters *m m'*, upon which toes the lower ends of the tappets *k k'* respectively rest. The said rock-shaft I is extended to a position where it can be suitably connected with the governor J, as shown in Fig. 1, and is provided at its

forward end with a rock-arm, *n*, which is pivotally connected to the governor-rod, as shown in Fig. 3, the arrangement being such that the rock-shaft I will be rocked by the rise and fall of the governor-balls, as will be well understood.

K K', Fig. 8, are the exhaust-valves, arranged to be moved to open and close the exhaust-ports *o o'*, in the manner hereinafter described. These valves K K' are both connected to the valve-rod L, so as to be moved to and fro by the longitudinal movement of said valve-rod. To the end of the valve-rod L is jointed the connecting-link M. The opposite end of this connecting-link is pivotally connected to the crank N, mounted on the crank-shaft O, Fig. 2. Upon the opposite end of this crank-shaft is mounted the spur-gear P. Meshing with the gear P is a segmental gear, Q, Figs. 1 and 2, which segmental gear is secured to the end of a rock-lever, R, pivoted to the frame of the engine at *p*. Motion is imparted to this rock-lever R by means of the eccentric S on the main shaft and the eccentric-rod T, the end of which is attached to the rock-lever R on the opposite side of the pivot *p* from the segmental gear. It will be found desirable to make the connection of the eccentric-rod with the rock-lever adjustable, and it is so shown in the drawings, Fig. 1, the rock-lever being provided with the slot *q* and the clamp-nut *r*, whereby the end of the eccentric-rod may be adjusted.

The operation and regulation of the valve-gear of the steam-valves are as follows: As the sliding bar G is moved longitudinally by means of the eccentric H and its connections—say in the direction of the arrow in Fig. 4—one of the tappets is brought in contact with the face of the pivoted latch on one of the rock-arms and causes the rock-shaft to which said arm is attached to turn on its axis and thereby open the corresponding valve. While this is taking place, the other tappet passes under the pivoted latch on the other rock-arm, simply swinging the latch upon its pivot, but without moving the rock-arm or the valve which is connected therewith. Upon the return motion of the sliding bar the operation will be reversed, the tappet which before passed un-

der its latch now engaging therewith and thereby moving that rock-arm and its valve, and the tappet which before engaged its latch now passing under the same without moving its rock-arm or valve. In this arrangement, as is well understood to be the case in engines of this general type heretofore constructed, the two tappets always act to open the valves at the same periods; but the periods when the tappets shall liberate the latches to permit the valves to be closed depend upon the elevation of the tappets—that is, the lower the tappets the quicker they will liberate the valves, and vice versa.

The regulation of the elevation of the tappets in the present improvement is automatically effected by means of the governor actuating the rock-shaft I upon the toes *m m'* on which the tappets rest, so that as the said rock-shaft is rocked in one direction or the other by the action of the governor the tappets are raised or allowed to fall, and the time of liberating the valves thereby regulated. As the movement of the rock-shaft I and the consequent movement of the tappets can be arranged to be very slight and gradual and has no material resistance to overcome, a very delicate regulation can be thereby secured. If the weight of the tappets *k k'* be insufficient to cause them to fall promptly by the action of gravity when allowed to do so by the rocking of the rock-shaft I, suitable springs of a strength sufficient merely to overcome the friction may be employed to effect their proper downward movement.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination, in a steam-engine for working steam expansively, of the governor, a rock-shaft carrying lifter-toes, tappets mounted in a sliding bar and working the steam-valves and set in position to determine the period of cut-off by the governor and lifter-toes, and pivoted latches mounted on the arms which work the steam-valve rods, substantially as described.

NOBLE T. GREENE.

Witnesses:

W. H. THURSTON,
S. J. MURPHY.