To all whom it may concern:

Be it known that we, JOHN F. CRAIG and THOMAS V. FLEMING, citizens of the United States, residing at Paris, in the county of Edgar and State of Illinois, have invented certain new and useful Improvements in Governor Mechanism for Rotary Engines; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in rotary engines, and particularly to governor mechanism for rotary engines of the type shown in our application, Serial No. 117,522, in which the engine-cylinder is rotatably mounted on a stationary shaft and cooperates with a piston fixed to the shaft.

The object of the invention is to provide a governor mechanism which is simple of construction, durable and efficient in use, and adapted to sensitively regulate the speed of the engine according to the resistance of the load.

With the above and other objects in view, which will readily appear as the nature of the invention is better understood, said invention consists in certain novel features of construction and combination and arrangement of parts, which will be hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a rotary engine embodying our invention. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a detail view of the controlling-valve.

Referring now more particularly to the drawings, 1 represents a hollow stationary shaft mounted in standards 2 and 2 and connected at one end with a steam-supply pipe 3 and at the other end with a steam-exhaust pipe 4.

5 is the engine-cylinder, which revolves on the shaft, and 6 an eccentric piston keyed to the shaft. The cylinder is provided with laterally-extending sleeves or bosses 7, giving an extended bearing on the shaft, which latter has a central partition 22, dividing its bore into steam supply and exhaust passages 23 and 24.

For a full disclosure of the construction of the piston and cooperating abutments (not shown) reference is to be had to our other application hereinbefore referred to, a complete description of the engine herein being deemed unnecessary, as the present invention relates solely to the governor mechanism. Suffice it to say that the piston is provided with suitable ports, passages, and valves governing the supply of steam to rotate the piston in either direction, of which 20 20' are steam-inlet ports communicating with the passage 23 through a port 25 in the shaft 1, and 21 21' exhaust-ports communicating with passage 24 through a port 25 in the shaft.

A valve 26 governs both ports 20 20', which are arranged on opposite sides of the center of a steam-inlet chamber 15, formed in the piston. This valve is connected by a bar 27, slidable in port 25, with a controlling-rod 28, extending through passage 23 to the exterior and connected to a pivoted controlling-lever 30. By means of these operating connections the valve 26 may be adjusted to close or partially close either passage 20 20' or close both passages at will. When steam is admitted through passage 20, the engine will be driven in one direction, and when steam is admitted through passage 20' the engine will be driven in the reverse direction. The drawings show passage 20' open and passage 20 closed to admit steam to revolve the cylinder to the 80 left, as indicated by the arrow in Fig. 1.

The governor mechanism automatically regulates the speed of the engine according to the resistance of the load and comprises a governor-arm 34, weighted at its outer end and pivoted upon a pin or bolt 35 on one side of the cylinder, so as to swing transversely of shaft 1. The inner end of the governor-arm is enlarged and formed with a slot 36, receiving a stop pin or bolt 37, which limits its swinging movement, and connecting the arm beyond its pivot with the engine-cylinder are springs 38 38', which normally act to hold the arm in a plane at right angles to the shaft 1. The said enlarged inner end of the governor-arm is preferably flat and slants obliquely to its plane of travel and fits within a diagonal groove formed by lugs 39, carried by a sleeve 40, said lugs being arranged at a diagonal or oblique angle to the plane of rotation of the sleeve. The sleeve 40 has a longitudinal groove 41, receiving a key or spline 42, formed on the sleeve 7, whereby it is mounted to rotate positively with the en-
gine-cylinder and slide longitudinally on sleeve 7. At its outer end the sleeve 40 carries an annular cam-flange 43, against the opposite faces of which bear friction-rollers on the inner end of a reciprocating bar 45, slidably mounted in bearings 46 on the adjacent standard 2 and pivotally connected at its outer end by a lever 47 with the rod 28, whereby the sliding movements of the sleeve 40 will reciprocate said rod 28, and thereby actuate the valve 26. The lever 47 is intermittently pivoted to a bar 48, sliding in a bearing 49 on the standard 2 and pivot-ed to the controlling-lever 30, so as to guide the latter in its swinging movements.

The operation is as follows: When the engine is at rest or running at normal speed, the parts stand in the positions shown in Figs. 1 and 2, with the governor at the neutral point and with the cam-flange 43 arranged between but not in contact with either roller 44 or 44'; but when the speed becomes excessive the weighted end of the governor arm is swung against the resistance of the opposing spring in a direction reverse to the direction of rotation of the engine, thereby forcing sleeve 40 inwardly or outwardly, as the case may be, thus causing the projections of the fluted cam-flange 43 to be brought into engagement with one of the rollers 44 or 44' and impart motion thereto to slide bar 45 and reciprocate rod 28 in the proper direction to partially or wholly close valve 26 against the operating inlet-passage 20 or 20', thereby reducing or wholly cutting off the flow of steam and slowing down the engine. As the engine slows down the governor returns to its normal position and operates valve 26 to open the passage 20 or 20' wide again. When the speed is too slow, the valve 26 if not set to fully open passage 20 or 20' is operated to fully open the passage by a swinging movement of the governor in the reverse direction to that previously described, as will be fully understood. Assuming that the engine is running in the direction of the arrow, Fig. 1, and the passage 20 is full open, when the speed of the engine becomes too great the weighted end of governor-arm 34 will swing to the right against the resistance of spring 38 and force sleeve 40 outward, thereby causing one of the cam projections of flange 43 to engage roller 44 and slide bar 45 outward, thus through lever 47 forcing rod 28 inward and partially or wholly closing valve 26 over passage 20. As the engine slows down the inlet-passage 20' restoring the governor to its normal position, and the governor acts on the diagonal lugs to slide sleeve 40 inward, thereby causing one of the cam projections of flange 43 to engage roller 44' and slide bar 45 inward, whereby rod 28 will be forced outward, moving valve 26 to open passage 20 and again admit steam to the cylin-der. When the speed is too slow, the valve 26 if not set to fully open passage 20 or 20' is operated by the outward movement of sleeve 40 by the governor-arm and the action of the cam-flange 43 on roller 44 to fully open passage 20 or 20', thereby admitting a full supply of steam to the engine to increase the speed thereof, as will be readily understood. It will thus be seen that the valve 26 will be automatically adjusted to regulate the speed of the engine according to the load thereon.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the construction, mode of operation, and advantages of this invention may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a governor for rotary engines, the combination with a hollow shaft, a rotating cylin-der, and an eccentric piston fixed to the shaft and having a steam-inlet port in communication with said shaft; of a valve controlling said port, a swinging governor carried by the cylinder, a sleeve reciprocated by said governor, a cam operated by said sleeve, and means engaged by the cam to operate said valve, substantially as described.

2. In a governor for rotary engines, the combination with a hollow shaft, a rotating cylin-der, and an eccentric piston fixed to the shaft and having a steam-inlet port in communica-tion with said shaft; of a valve controlling said port, a swinging governor carried by the cylinder, a sleeve reciprocated by said governor, a rod connected to the valve, a sliding bar connected to the rod, and a cam upon the sleeve for operating said bar, substantially as specified.

3. In a governor for rotary engines, the combination with a hollow shaft, a rotating cylin-der, and an eccentric piston fixed to the shaft and having a steam-inlet port in communica-tion with said shaft; of a valve controlling said port, a swinging governor carried by the cylinder, a sleeve having an inclined seat for the valve whereby the swinging of the valve will slide said sleeve in one direction or the other, springs resisting the movements of the governor, a rod connected to the valve, a sliding bar connected to the rod, and a cam upon the sleeve for operating said bar, substantially as and for the purpose set forth.

4. In a governor for rotary engines, the combination with a hollow shaft, a rotating cylin-der, and an eccentric piston fixed to the shaft and having a steam-inlet port in communica-tion with said shaft; of a valve governing said port, a governor pivotally mounted upon the cylinder to swing in a direction transversely of the shaft, a sleeve upon the cylin-
der sliding in a plane parallel with the shaft and having a diagonal groove receiving the governor; whereby the movement of the latter will slide the sleeve in one direction or the other, and means controlled by the sleeve for operating the valve, substantially as and for the purpose described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

JOHN F. CRAIG.
THOMAS V. FLEMING.

Witnesses:

GEO. W. BRADSHAW,
H. P. LAMASTER.