

H. C. DUNNING.
STEAM ENGINE.
APPLICATION FILED MAR. 19, 1917.

1,243,494.

Patented Oct. 16, 1917.

3 SHEETS—SHEET 1.

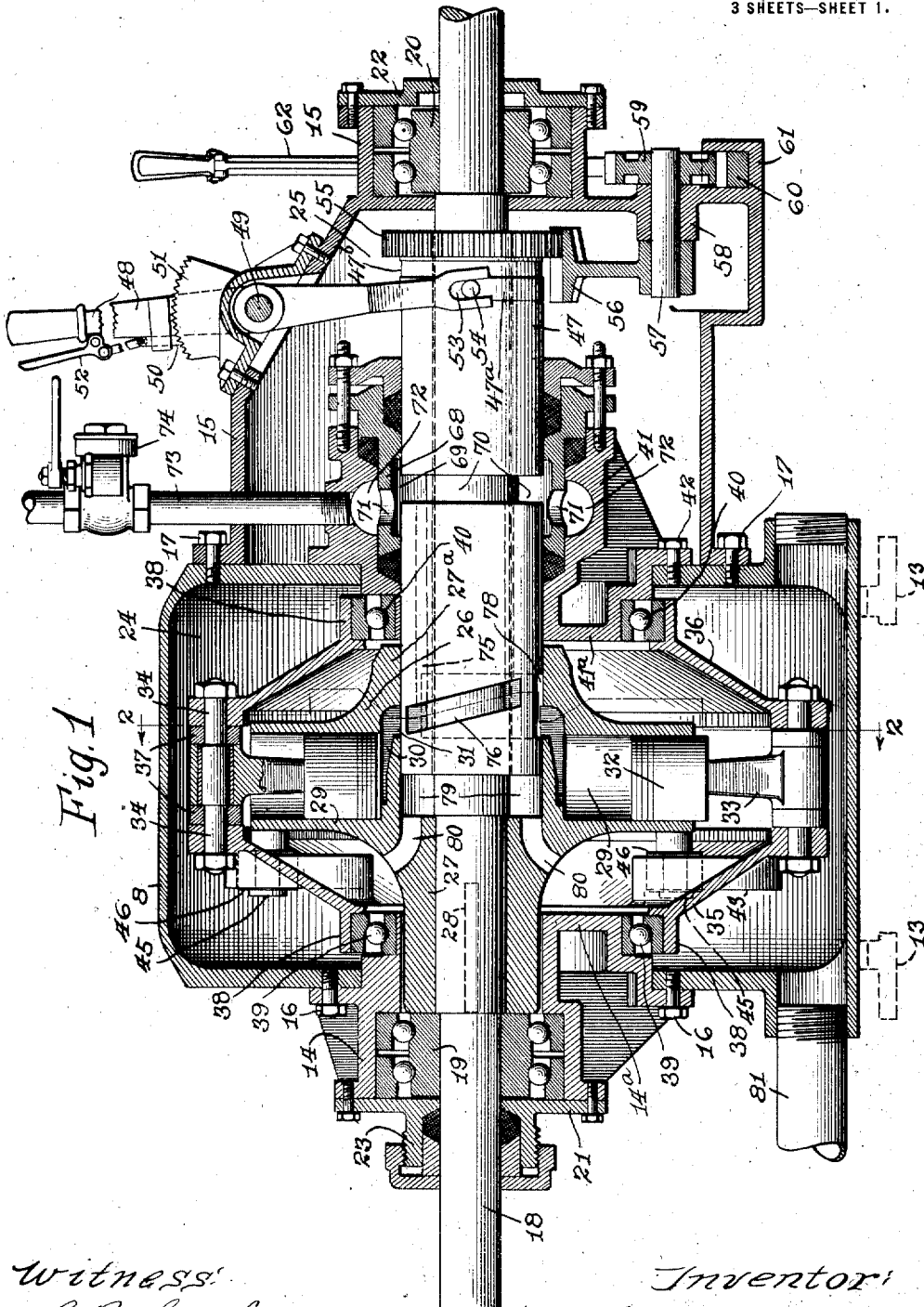


Fig. 1

Witness:
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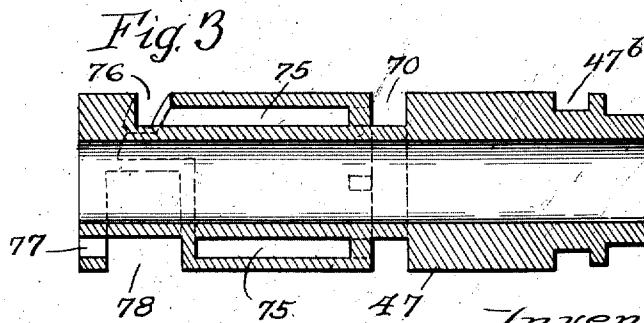
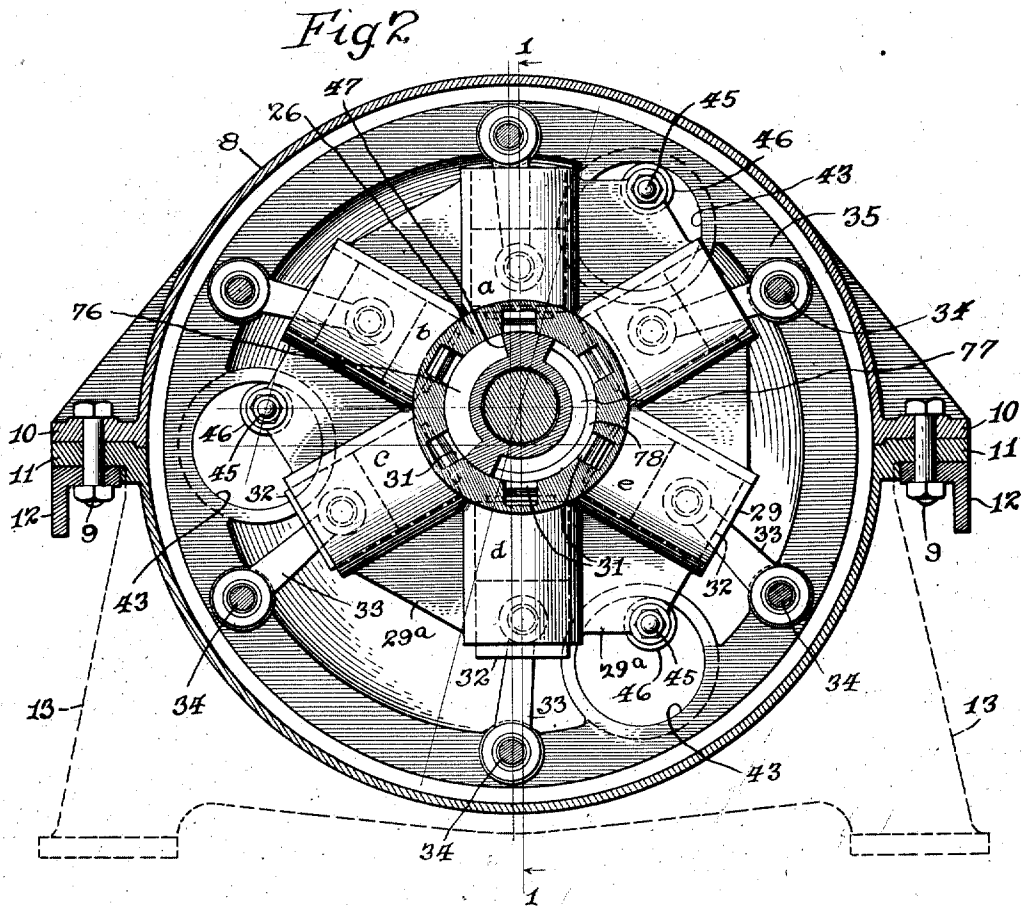
By

Inventor:
Harry C. Dunning,
Attys.

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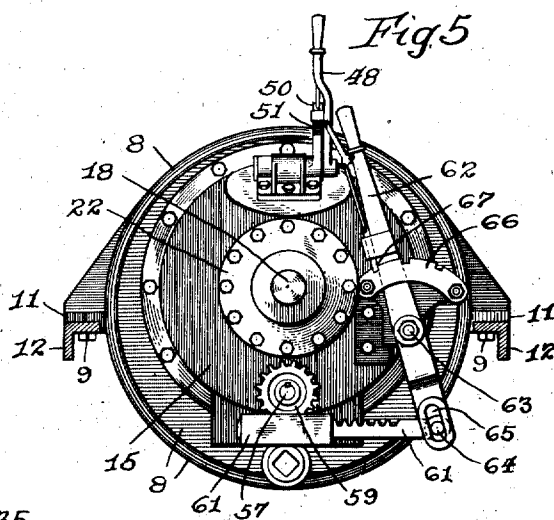
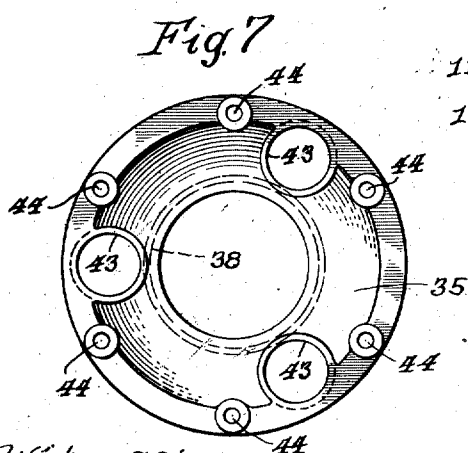
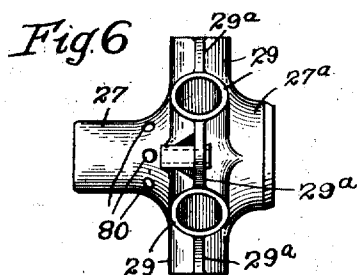
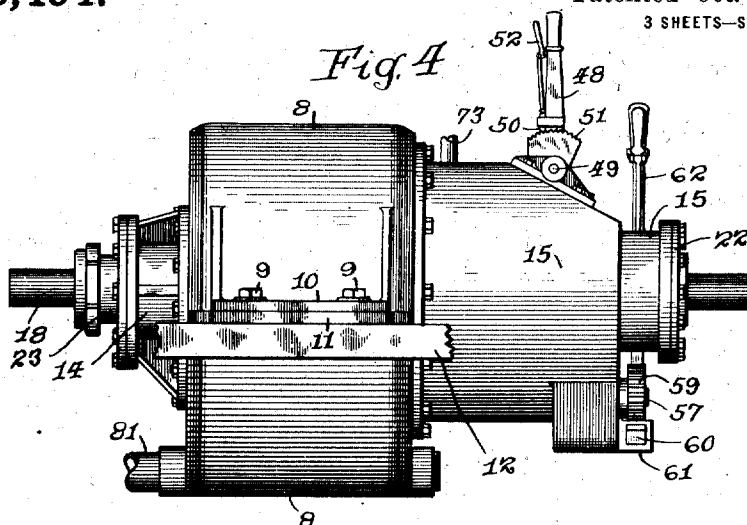
Inventor:
Harry C. Dunning,
Adams & Jackson
Attys.

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3 SHEETS—SHEET 3.



Witness:
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Inventor:
Harry C. Dunning,
By Adams Jackson
Att'y.

UNITED STATES PATENT OFFICE.

HARRY C. DUNNING, OF CHICAGO, ILLINOIS.

STEAM-ENGINE.

1,243,494.

Specification of Letters Patent.

Patented Oct. 16, 1917.

Application filed March 19, 1917. Serial No. 155,871.

To all whom it may concern:

Be it known that I, HARRY C. DUNNING, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification, reference being had to the accompanying drawings.

- 10 My invention relates to steam engines of that type in which a plurality of cylinders and their pistons are arranged to rotate, the rotary effect being produced by the admission of steam to the cylinders in proper sequence. It has for its objects to provide 15 an improved high-speed engine which will be perfectly balanced so that there will be an entire absence of vibration; to provide an engine which may be operated at either very high or very low speeds, and may be reversed instantly regardless of the speed at which it is operating; to provide an improved construction by which a wide range of adjustment of cut-off mechanism may be 25 secured; and to provide an engine that will be compact and simple in construction and economical of operation. I accomplish these objects as illustrated in the drawings and as hereinafter described. That which I believe 30 to be new is set forth in the claims.

In the accompanying drawings,—

Figure 1 is a longitudinal sectional view of my improved engine, substantially on line 1—1 of Fig. 2;

- 35 Fig. 2 is a vertical cross-section on line 2—2 of Fig. 1;

Fig. 3 is a sectional view illustrating the steam sleeve by the adjustment of which the cut-off is regulated and the engine reversed;

- 40 Fig. 4 is a side elevation of the engine, certain parts being broken away;

Fig. 5 is an end view of the right-hand end of the engine as shown in Fig. 4;

- 45 Fig. 6 is an elevation of the cylinder-block; and

Fig. 7 is an inner face view of one of the concentrically-mounted guide-disks.

Referring to the drawings,—

- 50 8 indicates the intermediate portion of the main frame of the engine, which also constitutes a housing and which incloses the principal operating parts, such as the cylinder-block and guide-disks. The member 8 is preferably made in two semi-cylindrical sections, as shown in Fig. 4, connected by bolts

9 passing through flanges 10—11, but any suitable construction for the purpose may be employed. The member 8 may be provided with any suitable standard or base, but in the drawings I have illustrated it as being 60 provided with horizontally-disposed angle-irons 12 secured to the flanges 11,—said angle-irons forming a means of connection for standards 13 at the ends of the engine, as indicated by dotted lines in Fig. 2. This 65 construction, however, may be varied as desired as it is not essential. 14—15 indicate end members of the frame, which are attached, respectively, to opposite ends of the member 8, as shown in Fig. 1, preferably by 70 bolts 16—17, so that they may be removed when necessary. The members 14—15 support various parts of the mechanism, as will hereinafter appear. 18 indicates the main or power-transmitting shaft of the engine, 75 which is solid and extends through the members 8, 14 and 15 of the frame, as shown in Fig. 1, and is rotatably supported by the members 14—15. In order to minimize friction, ball-bearings 19—20 are provided in 80 the members 14—15 for supporting the end portions of said shaft, said ball-bearings being fitted in suitable recesses covered by removable cap-plates 21—22, respectively. In the drawings I have shown the cap-plate 85 21 as being provided with a stuffing-box 23 around the shaft 18, and if desired the cap-plate 22 may be similarly equipped. 24 indicates a chamber within the frame member 8, and 25 indicates a chamber within the 90 frame member 15.

26 indicates a cylinder-block, the construction of which is best shown in Figs. 1, 2 and 6. It comprises a circular casting having a hub portion 27 at one side which 95 fits snugly upon the shaft 18 and is non-rotatably secured thereto, preferably by a key 28 shown in dotted lines in Fig. 1; a hub portion 27^a at the other side, concentric with the hub portion 27, having a bore 100 of somewhat greater diameter than the bore of the hub portion 27, to enable it to fit upon the steam sleeve hereinafter described; and a plurality of cylinders 29 radially disposed around the axis of the cylinder-block 105 and spaced equally distant apart. Said cylinders are connected by webs 29^a, as shown in Fig. 2. Any desired number of cylinders may be provided, but for purposes of illustration I have shown six in the drawings. 110

These cylinders open at their outer ends into the chamber 24, their inner ends opening into passages 30 having ports 31 opening into the bore of the hub portion 27^a. 32 indicates pistons fitted in the cylinders 29 and having piston-rods 33. Said piston-rods are pivoted at their upper ends upon pivot-bolts 34 which are carried by two oppositely-disposed guide-disks 35—36. Said disks are 10 funnel shaped or approximately concavo-convex, and are held together by the pivot-bolts 34, spacing-collars 37 being provided between the marginal portions of said disks and the end portions of the piston-rod bearings, as shown in Fig. 1. The disks 35—36 are open at the center, where they are provided with axial flanges 38 which are mounted upon ball-bearings 39—40 which are supported by the frame of the engine eccentrically of the axis of the shaft 18, as shown in Fig. 1. As therein illustrated, the bearings 39 are supported by an inwardly-projecting portion 14^a of the frame member 14, and the bearings 40 are supported by an inwardly-projecting portion 41^a of a frame 41 which is disposed in the chamber 25 and projects into the chamber 24 at the right-hand side thereof, as shown in Fig. 1. 42 indicates bolts securing the frame 41 to the 30 frame member 8. 43 indicates a plurality of circular bearings or rings carried by one or both of the guide-disks 35—36 in the peripheral portions thereof and between the holes 44 which receive the pivot-bolts 34, as shown in Fig. 7. In the drawings I have shown the guide-bearings 43 as provided only in the guide-disks 35, but obviously they may also be provided in the disk 36. Said guide-bearings are preferably spaced 40 equally distant apart, as shown. 45 indicates studs which project laterally from the webs 29^a, the number of said studs corresponding with the number of bearing rings 43. Said studs carry rollers 46 which are adapted to travel around the inner surfaces of said bearing rings, as best shown in Fig. 2 and act to make the cylinder-block 26 and the guide-disks 35 and 36 rotate together notwithstanding the eccentricity of their respective axes,—this being compensated for by the fact that the rollers 46 move radially with reference to the axis of the guide-disks as they travel over the inner surfaces of the guide-rings 43. At the same time a limited 50 amount of relative rotation is permitted between the guide-disks and the cylinder-block, since the rollers 46 also are shifted tangentially with reference to the guide-disks as they travel around the guide-rings 43. It will be apparent from an inspection of Fig. 2 that by the construction described the several pistons will at any instant occupy different positions in their respective cylinders. With the parts in the situation 60 there shown, the uppermost piston occupies

approximately its innermost position while the piston at the diametrically opposite side of the power shaft is in its most extended position, the pistons at either side of the two positions mentioned then occupying 70 various intermediate positions, as indicated by the dotted lines. It will be apparent, also, that the stroke of the several pistons is increased somewhat owing to the oscillation of the guide-disks 35—36 with relation 75 to the cylinder-block, as clearly indicated in Fig. 2.

The cylinder-block, guide-disks and power-transmitting shaft are caused to rotate by the admission of steam in the several cylinders in succession by means of suitable controlling mechanism adjustable to regulate the portion of each cycle during which the steam is admitted, and also to regulate the direction of rotation of the 85 power shaft and the parts connected therewith. Such controlling or regulating mechanism will now be described.

47 indicates a sleeve, which I term a "steam sleeve", as it controls the admission 90 of steam to the several cylinders and also the exhaustion of steam therefrom. The construction of said sleeve is best shown in Figs. 1 and 3. As therein shown, said sleeve which is suitably journaled in the frame 95 member 41^a, is adapted to fit over the main shaft 18 and also to fit into the hub portion 27^a which bears upon its outer surface, as shown in Fig. 1, so that the ports 31, except as hereinafter explained, are closed by said 100 sleeve. Said sleeve is supported independently of said shaft and is out of contact therewith, as shown in Fig. 2, and indicated in dotted lines in Fig. 1. It is also movable longitudinally thereof. For the purpose of 105 accomplishing the latter movement, I prefer to employ a hand-lever 48 suitably mounted upon a pivot 49 upon the frame member 15 and having the usual locking-dog 50 and rack 51 operated by a hand-lever 52 110 carried by the lever 48. Said lever is pivoted between its ends, its lower end being bifurcated to straddle the sleeve 47, and its branches having recesses 53 to receive pins 54 projecting from diametrically-opposite 115 points on a collar 47^a fitted in a groove 47^b in the right-hand end portion of the sleeve, as shown in Figs. 1 and 3. Thus, by rocking the lever 48 the sleeve 47 may be shifted longitudinally upon the shaft 18 but it is 120 left free to be rocked as hereinafter described. For rocking said sleeve I provide a gear 55 which engages a wide segmental rack 56 mounted to rock upon the pivot 57. Said pivot, which is journaled in a boss 58 125 carried by the frame member 15, also carries a pinion 59 with which meshes a rack-bar 60 adapted to slide in a suitable guide 61, as shown in Fig. 1. A lever 62 mounted on a pivot 63, shown in Fig. 5, is connected with 130

the rack-bar 61 by pins 64 moving in a slot 65 in the lower end portion of said lever. Consequently, by operating the lever 62, the pinion 59 may be oscillated, thereby rocking the pivot 57 and the rack 56. The rocking movement of said rack 56 is transmitted to the sleeve 47 by the gear 55. The lever 62 is provided with a notched rack 66 and locking-dog 67 so that it may be secured either at its neutral point or in forward or reverse position. I prefer to use the construction shown for rocking the steam sleeve, but any other suitable arrangement for the purpose may be employed. The manner in which the rocking of said sleeve affects the direction of rotation of the engine will be hereinafter explained.

As best shown in Fig. 1, the steam sleeve 47 extends through a sleeve 68 which is fitted in the casting 41 and forms an annular chamber 69 around a section of the periphery of the steam sleeve 47, in which is provided an annular slot 70. The chamber 69 is adapted to be supplied with steam through openings 71 in the sleeve 68, which openings communicate with an annular passage 72 in the casting 41, said passage being supplied with steam through a pipe 73 provided with a throttle-valve 74 of any suitable type. Thus, steam entering through pipe 73 flows through passage 72 and openings 71 into chamber 69 and thence through groove 70 into a longitudinal passage 75 between the steam sleeve 47 and the shaft 18, as indicated by dotted lines in Fig. 1, and better shown in Fig. 3. Said passage is preferably cylindrical in form, as shown in Fig. 3, and terminates in a diagonally-disposed slot 76 in the outer surface of the steam sleeve which extends through an angle of preferably about one hundred and twenty-two degrees. Said slot is inclined in order that by moving the steam sleeve 47 longitudinally a greater or less portion of such slot may be caused to underlie the path of the ports 31 as the cylinder-block rotates. The construction is such that within a range of movement of the sleeve 47 defined by the width of said slot 76, a variation of the cut-off from zero to one hundred and twenty-two degrees of arc may be obtained. For example, by placing the steam sleeve so that no portion of the slot 76 underlies the path of the ports 31, no steam will be admitted to the cylinders at any point in their rotation. By moving the sleeve 47 longitudinally so that throughout its length it underlies some portion of the path of the ports 31, steam will be admitted to the cylinders while they move through an arc of approximately one hundred and twenty-two degrees, or whatever other arc may be comprehended within the length of the slot. Intermediate positions of the sleeve 47 correspondingly affect the point of cut-off. At the inner end of the

sleeve 47 and extending inwardly from such inner end is a segmental passage 77 which, in the construction shown, extends through an arc of one hundred and eighty degrees, and opens into a peripheral groove or recess 78 in the sleeve 47 which underlies the path of the ports 31 at all times regardless of the longitudinal adjustment of said sleeve. Said groove 78 also extends through an arc of one hundred and eighty degrees and it is located at the opposite side of the sleeve 47 from the slot 76, as shown in Fig. 2. Said recess 78 and the passage 77 form exhaust passages through which the exhaust steam may escape into an exhaust chamber 79 lying between the hub portion 27 and the inner end of the sleeve 47. Passages 80 lead from the exhaust chamber 79 to the space between the guide-disks 35-36, whence the exhaust steam flows to the chamber 24, and is then discharged through an exhaust pipe 81 shown in Fig. 4. Some of the exhaust steam also is discharged through the space between the sleeve 47 and the shaft 18.

The operation of the engine is as follows: With the parts in the position shown in Figs. 1 and 2, the piston of cylinder *a* is slightly beyond dead center, assuming the cylinder-block to be rotating in a counter-clockwise direction. At this time steam is being admitted to cylinders *b* and *c* and is exhausting from cylinders *d*, *e*, and *f*. No steam is being admitted to cylinder *a*, however, because its port 31 is closed since it overlies an unbroken portion of the surface of the sleeve 47. As soon as the cylinder-block continues its rotation far enough to bring the port of cylinder *a* over the slot 76, steam will be admitted to said cylinder, but cylinders *b* and *c* will continue under pressure since the latter cylinder will not be cut off until its port 31 is closed by said sleeve. Thus, three cylinders will be receiving steam while the other three will be exhausting. The admission of steam to cylinder *a* will force its piston outward, and owing to the eccentricity of the guide-disks 35-36 its piston-rod will assume an inclined position with reference to the axis of the cylinder, as illustrated in connection with the other cylinders. Soon after each cylinder passes the position of cylinder *c*, its steam will be cut off, and shortly before it reaches the position of cylinder *d* it will be connected with the exhaust passage 78. This is timed to occur when the different pistons reach the outer limit of their movement. On the return stroke of the pistons the steam will be exhausted in the manner already described. By shifting sleeve 47 longitudinally to the right, the period during which steam is admitted may be reduced as desired so that the engine may be allowed to run for a greater or less part of its cycle on expansion. To reverse the engine, the

sleeve 47 is partly rotated by means of the reverse lever 62 so as to admit steam to the cylinders when they occupy the position of cylinders *f*, *e*, and *d*, as shown in Fig. 2—

- 5 that is to say, before their respective pivot pins cross the dead center line—consequently causing the cylinder-block to rotate in the opposite direction. This reversal may be effected at any time regardless of the speed of the engine, as its effect will be simply to stop the rotation of the cylinder-block in one direction and resume it in the opposite direction. It will be noted that at all times several of the cylinders are under pressure, consequently the torque is practically constant, giving very uniform results with the absence of vibration, making possible the attainment of very high speed with consequent increase of power.
- 20 I wish it to be understood that my invention is not restricted to the specific embodiment thereof illustrated in the drawings, but includes generically the subject-matter of the claims hereinafter made, except in so far as such claims are directed to particular features of the construction shown and described.

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

- 30 1. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a plurality of cylinders mounted on said shaft between its ends and connected to rotate therewith, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, controlling means adjustable to vary the point of cut-off, means for adjusting said controlling means, and means connected with said controlling means for supplying steam to the engine.
- 35 2. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a cylinder-block mounted on said shaft between its ends and connected to rotate therewith and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, controlling means adjustable to vary the point of cut-off, means for adjusting said controlling means, and means connected with said controlling means for supplying steam to the engine.
- 50 3. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a plurality of cylinders mounted on said shaft between its ends and connected to rotate therewith, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, an adjustable steam sleeve fitted over said shaft and having a port in its outer surface for admitting steam to said cylinders and a longitudinally-extending passage for
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conducting steam to said port and means connected with said steam sleeve for supplying steam thereto.

4. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a cylinder-block mounted on said shaft between its ends and connected to rotate therewith and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, an adjustable steam sleeve fitted over said shaft and having a port in its outer surface for admitting steam to said cylinders and a longitudinally-extending passage for conducting steam to said port and means connected with said steam sleeve for supplying steam thereto.

5. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a plurality of cylinders mounted on said shaft between its ends and connected to rotate therewith, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a steam sleeve fitted over said shaft and having a port in its outer surface for admitting steam to said cylinders, a longitudinally-extending passage for conducting steam to said port and a peripheral exhaust passage.

6. A steam engine, comprising a solid rotating shaft, bearings for the end portions of said shaft, a cylinder-block mounted on said shaft between its ends and connected to rotate therewith and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, and a steam sleeve fitted over said shaft and having a port in its outer surface for admitting steam to said cylinders, a longitudinally-extending passage for conducting steam to said port and a peripheral exhaust passage.

7. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, an adjustable sleeve concentric with and extending over said shaft for controlling the admission of steam to said cylinders and having a steam conducting passage, and means connected with said sleeve for supplying steam thereto.

8. A steam engine, comprising a rotating shaft, a cylinder-block mounted to rotate with said shaft and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, an adjustable sleeve concentric with and extending over said shaft for controlling the admission of steam to said cylinders

ders, and having a steam conducting passage, and means connected with said sleeve for supplying steam thereto,

9. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft for regulating the cut-off.

10. A steam engine, comprising a rotating shaft, a cylinder-block mounted to rotate with said shaft and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, and a sleeve extending over and supported independently of said shaft for regulating the cut-off.

11. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft, said sleeve being movable longitudinally for varying the cut-off.

12. A steam engine, comprising a rotating shaft, a cylinder-block mounted to rotate with said shaft and having a plurality of cylinders, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinder-block, and a sleeve extending over and supported independently of said shaft, said sleeve being movable longitudinally for varying the cut-off.

13. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft, said sleeve being movable longitudinally for varying the cut-off, and having a longitudinally-extending steam passage therein and a diagonal slot in the outer surface thereof communicating with said passage.

14. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, a sleeve extending over and supported independently of said shaft, said sleeve being movable longitudinally for varying the cut-off, and having a longitudinally-extending steam passage therein and a diagonal slot in the outer surface thereof communicating with said passage, and an exhaust passage in said sleeve.

15. A steam engine, comprising a rotating

shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft, said sleeve being movable independently of said shaft to reverse the direction of rotation of the engine.

16. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft, said sleeve being rotatable independently of said shaft to change the direction of rotation of the engine.

17. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, and a sleeve extending over and supported independently of said shaft, said sleeve being rotatable independently of said shaft, said sleeve being also movable longitudinally of said shaft whereby the direction of rotation of the engine and the cut-off may be varied by adjusting said sleeve.

18. A steam engine, comprising a rotating shaft, a plurality of cylinders mounted to rotate with said shaft, pistons operating in said cylinders, eccentric means connected with said pistons and rotating with said cylinders, a sleeve extending over and supported independently of said shaft, said sleeve being rotatable independently of said shaft and being also movable longitudinally of said shaft whereby the direction of rotation of the engine and the cut-off may be varied by adjusting said sleeve, and an exhaust passage in said sleeve.

19. A steam engine, comprising a plurality of cylinders radially disposed about a common center, axially-disposed means for controlling the admission of steam to the inner end portions of said cylinders in sequence, pistons in said cylinders, a rotary eccentrically-mounted member, piston-rods connecting said member with each of said pistons, means connecting said eccentrically-mounted member with said cylinders and permitting relative movement thereof incident to the eccentricity of their respective axes, a solid shaft upon which said cylinders are mounted between its ends, and bearings for the end portions of said shaft.

20. A steam engine, comprising a plurality of cylinders radially-disposed about a common center, a rotary shaft upon which said cylinders are mounted, axially-disposed means concentric with said shaft for controlling the admission of steam to the inner end

portions of said cylinders in sequence, pistons in said cylinders, a rotary eccentrically-mounted member, piston-rods connecting said member with each of said pistons, one
 5 or more circular bearings carried by said eccentrically-mounted member, and a roller or rollers of less diameter than the internal diameter of said bearings connected with
 10 said cylinders and operating in said bearing or bearings for connecting said member with said cylinders and permitting limited movement thereof with relation to each other.

21. A steam engine, comprising a cylinder-block having a plurality of cylinders
 15 radially disposed around a common axis and axially-disposed ports leading to the inner end portions of said cylinders, a steam sleeve having an external journal bearing in said cylinder-block for controlling the admission
 20 of steam to said cylinders in sequence, pistons in said cylinders, and means connected with said pistons and actuated thereby for effecting the rotation of said cylinder-block.

22. A steam engine, comprising a cylinder-block having a plurality of cylinders
 25 radially disposed around a common axis and axially-disposed ports leading to the inner end portions of said cylinders, a sleeve having an external journal bearing in said cylinder-block for controlling the admission of
 30 steam to said cylinders in sequence, pistons in said cylinders, and means connected with said pistons and actuated thereby for effecting the rotation of said cylinder-block, said
 35 sleeve being adjustable to vary the cut-off.

23. A steam engine, comprising a cylinder-block having a plurality of cylinders
 radially disposed around a common axis and
 40 axially-disposed ports leading to the inner end portions of said cylinders, a sleeve having an external journal bearing in said cylinder-block for controlling the admission of

steam to said cylinders in sequence, pistons in said cylinders, and means connected with said pistons and actuated thereby for effect- 45
 ing the rotation of said cylinder-block, said sleeve being adjustable to reverse the direction of rotation of the engine.

24. A steam engine, comprising a power-transmitting shaft, a cylinder-block mounted upon and keyed to said shaft between the
 50 ends thereof, bearings for the end portions of said shaft, said cylinder-block having a plurality of radially-disposed cylinders, a steam sleeve constituting a steam conduit
 55 adjustably mounted over said shaft and co-operating with said cylinders to control the admission of steam thereto, manually operated means for adjusting said sleeve, pistons in said cylinders, an eccentrically-mounted
 60 disk connected with said pistons, and means operatively connecting said disk with said cylinder-block for permitting relative movement thereof to compensate for the eccentricity of their respective axes. 65

25. A steam engine, comprising a power-transmitting shaft, a cylinder-block mounted upon and keyed to said shaft, said cylinder-block having a plurality of radially-dis- 70
 posed cylinders, a steam sleeve constituting a steam conduit adjustably mounted over said shaft and coöperating with said cylinders to control the admission of steam thereto, manually operated means for adjusting
 75 said sleeve, pistons in said cylinders, eccentrically-mounted disks at opposite sides of said cylinder-block, means connecting said disks with said pistons, and means connecting said disks with said cylinder-block and permitting relative movement thereof to
 80 compensate for the eccentricity of their respective axes.

HARRY C. DUNNING.