(No Model.) 2 Sheets—Sheet 1.

# C. B. PERLEY.

## STEAM STEERING APPARATUS.

No. 570,680. Patented Nov. 3, 1896.

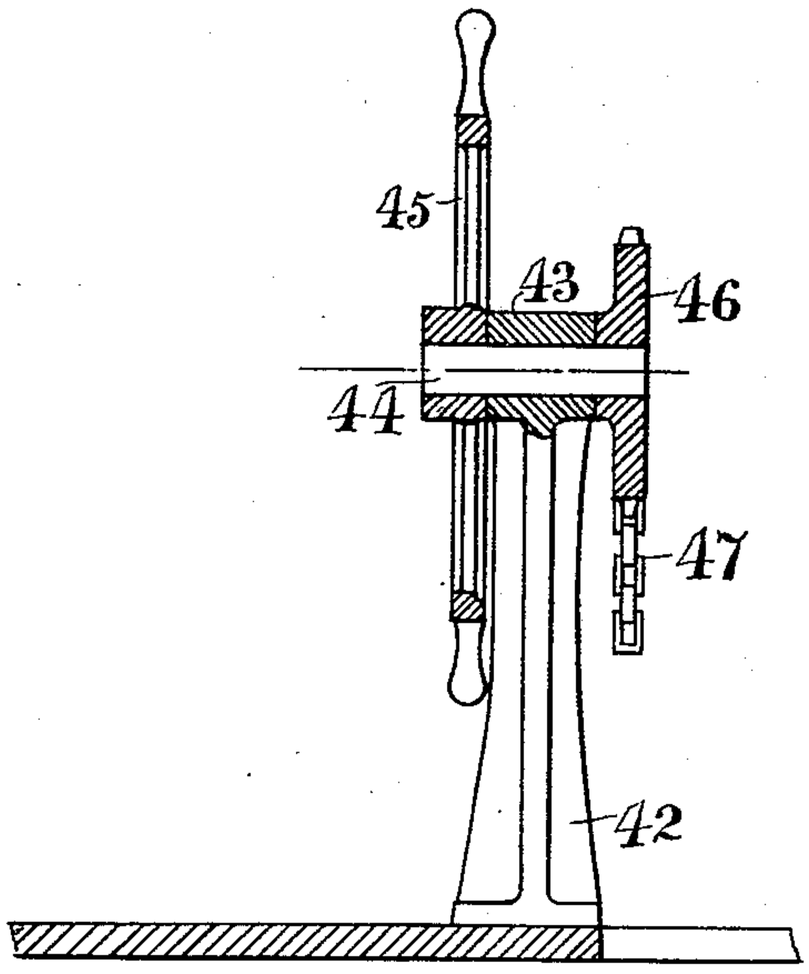
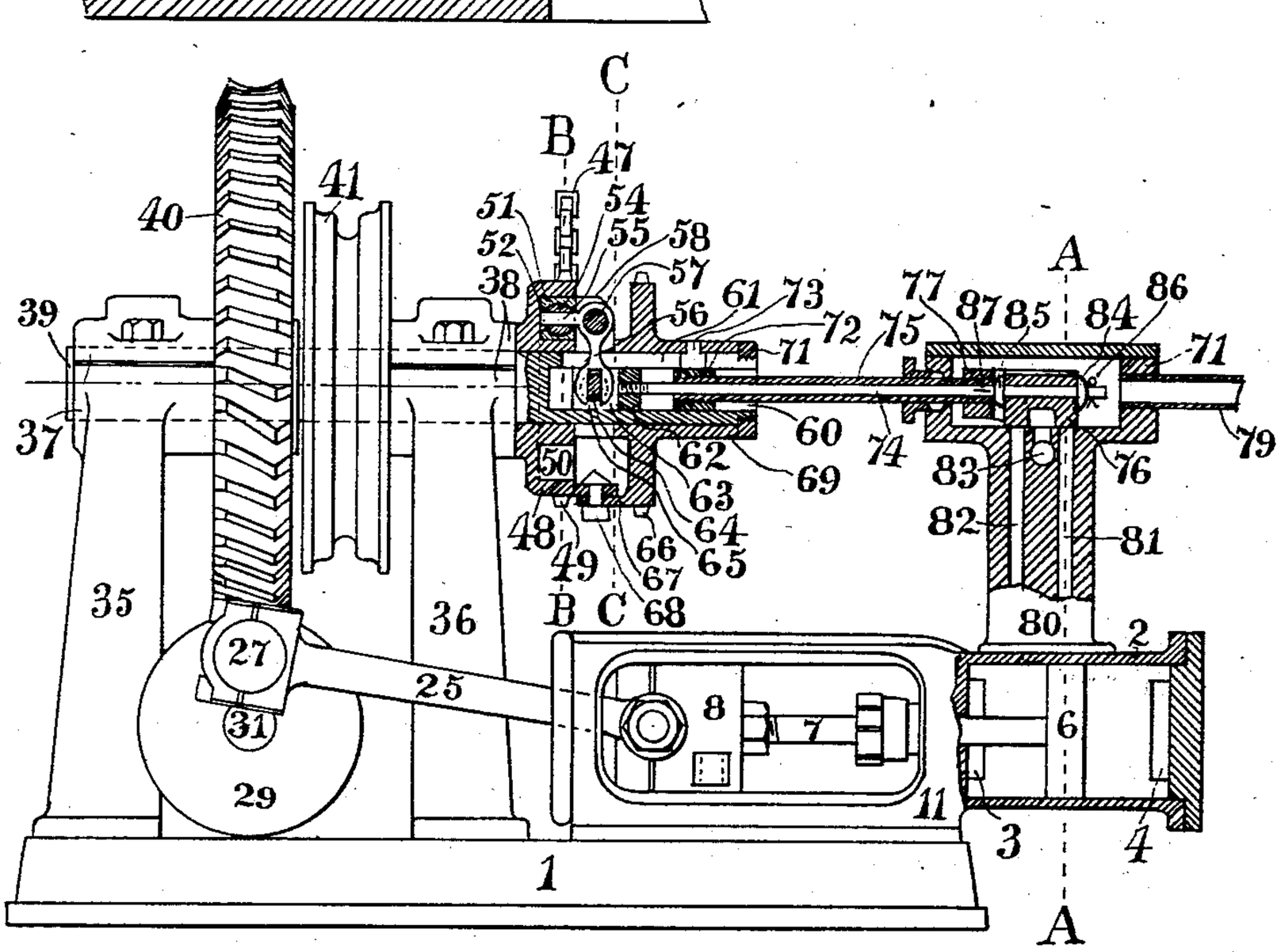



Fig. 1

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(No Model.) 2 Sheets—Sheet 2.

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## STEAM STEERING APPARATUS.

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Fig. 3

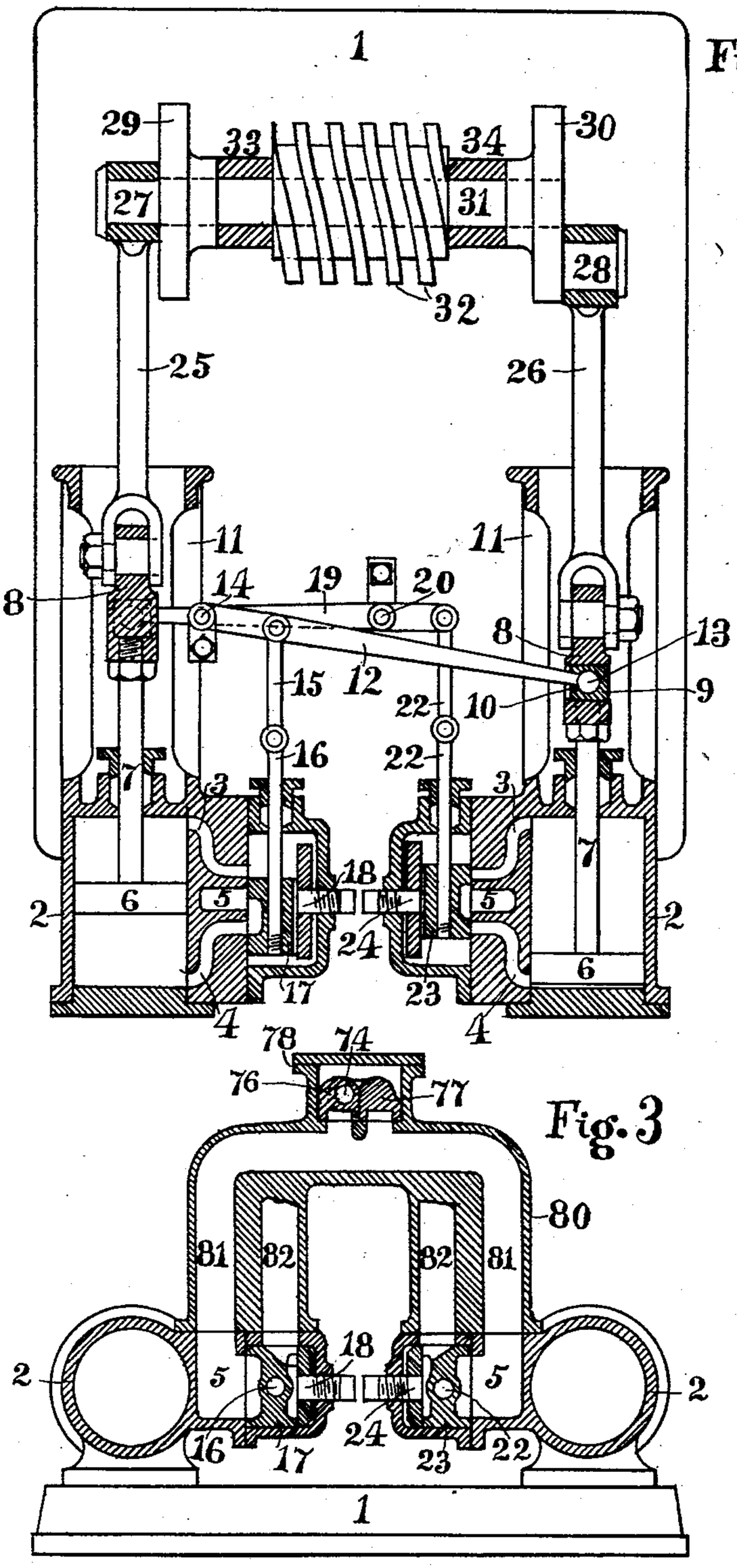


Fig. 2

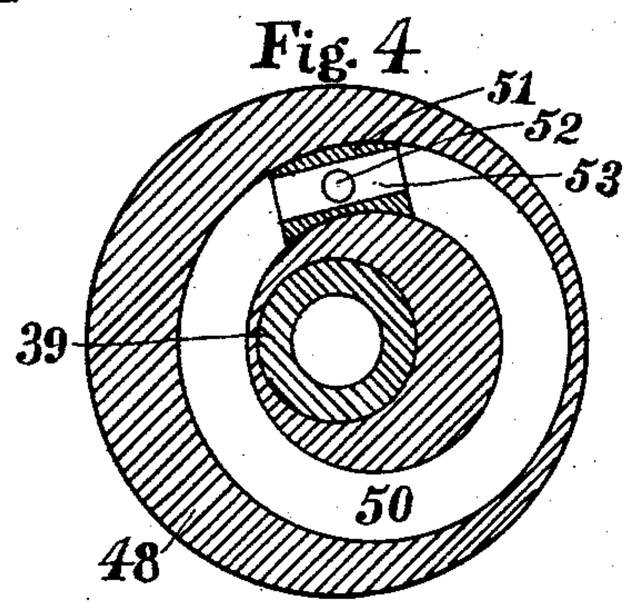


Fig. 4

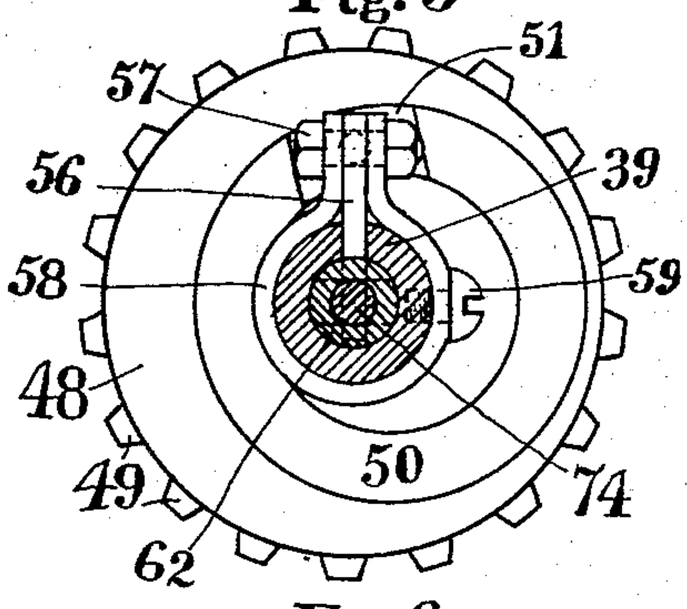


Fig. 5

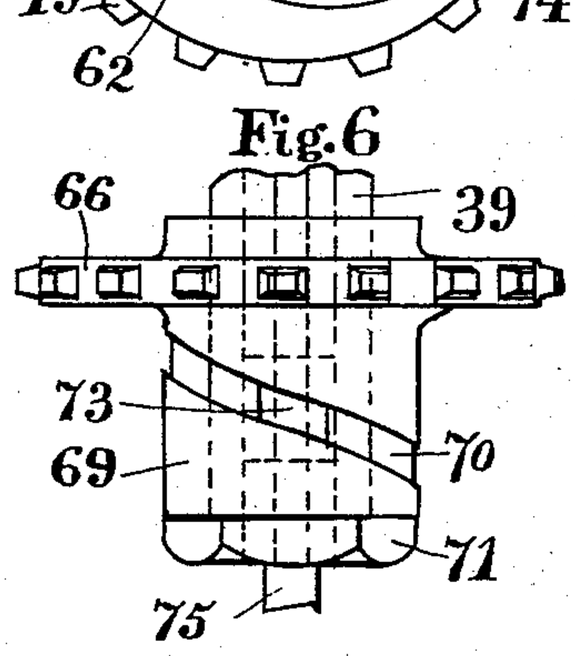


Fig. 6

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# UNITED STATES PATENT OFFICE.

CHAUNCY B. PERLEY, OF PORT HURON, MICHIGAN, ASSIGNOR TO THE JENKS SHIP BUILDING COMPANY, OF SAME PLACE.

## STEAM STEERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 570,680, dated November 3, 1896.

Application filed June 12, 1896. Serial No. 595,310. (No model.)

*To all whom it may concern:*

Be it known that I, CHAUNCY B. PERLEY, a citizen of the United States, residing at Port Huron, in the county of St. Clair and State of Michigan, have invented certain new and useful Improvements in Steam Steering Apparatus; and I 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to steam steering apparatus, and has for its object the improvement of the reversing-valve mechanism common to such devices.

It is also an object of my invention to provide a reversing-valve which will operate free from the defect known as "wire-drawing" steam served by the valve to the engines.

My invention consists essentially of two contiguous but independent reversing slide-valves of different superficial area, and in the novel construction of the means for actuating them.

Each constituent element of my invention is described in detail and its office, together with the mode of operation of the whole, fully explained hereinafter.

Referring to the accompanying drawings, wherein like numbers are used to designate the same parts throughout the several views, Figure 1 represents a side view of my invention, showing the pilot-wheel and sprocket-chain, one of the engines, the worm-wheel, the drum for the rudder-chain, and in vertical section a portion of the worm-wheel shaft, the reversing-valve, and mechanism by which it is operated. Fig. 2 represents a top plan view, partly in horizontal section, of the duplicate engines and their immediate slide-valve connections. The driving-shaft, worm, and bed-plate are also shown in the second figure. Fig. 3 represents a vertical sectional view of the engine-cylinders, the reversing-valve, and steam-port casing, taken upon the line A A of the first figure. Fig. 4 represents a vertical sectional view of the complete cam-grooved sprocket-wheel, taken upon the line B B, as shown in the first figure. Fig. 5 represents a front view of the cam-grooved sprocket-wheel, showing an end view of the bell-crank lever with its supporting-strap and a section of the worm-wheel shaft upon the line C C, as indicated in the first figure. Fig. 6 represents a top view of the auxiliary sprocket-wheel, showing its extended hub, the helical slot formed through the extension and partly around it, and the retaining-nut employed to hold the sprocket-wheels upon the worm-wheel shaft. Figs. 4, 5, and 6 are drawn upon a slightly larger scale than that selected for the remaining views, in order to present the smaller parts more clearly.

Considering Fig. 2, numeral 1 designates the bed-plate, 2 2 the suitably-supported cylinders of the twin engines having the regular steam-ports 3 3 and 4 4, and what would ordinarily be exhaust-ports 5 5, to be again referred to below.

6 6 mark the pistons, 7 7 the piston-rods, 8 8 the sliding cross-head blocks, each provided with a channeled block 9, adapted to be reciprocated within a transverse orifice 10, which usually extends through the cross-head blocks. (See also Fig. 1.) The cross-heads travel within guides borne by engine-frames 11 11 of common construction.

Numeral 12 designates the longer of the two valve-operating levers. It is connected by pivot 13 to channeled block 9, working within the cross-head of the right-hand engine. It possesses a fulcrum 14 upon the bed-plate, and is pivotally connected by rod 15 with valve-stem 16 and valve 17, which forms a part of engine. (Shown upon the left of Fig. 2.)

18 marks the mechanism employed to balance valve 17, and may be of any chosen pattern.

Number 19 designates the second and shorter of the two levers shown in Fig. 2. Similarly with the longer lever, it is pivoted to channeled block 9, working within the cross-head of the left-hand engine. It possesses a fulcrum 20 upon the bed-plate, and

is connected by rod 21 with valve-stem 22 and slide-valve 23 of engine upon the right of Fig. 1.

24 marks the mechanism employed to balance valve 23.

It is clearly within the scope of my invention to arrange the various parts with the view of utilizing levers of equal length, and it is likewise apparent that the customary eccentric valve-gear could replace the levers and their connections. Owing, however, to the necessity for compactness of construction and to the size and position of the driving-shaft and worm, the lever-operated slide-valves are found to be the more convenient.

Numbers 25 and 26 designate, respectively, the pitman-rods of the left and right hand engines; 27 28, the wrist-pins; 29 30, the crank-plates, and 31 the driving-shaft, upon which is fixed the worm 32.

33 34 mark the driving-shaft bearings supported upon the bed-plate.

Upon standards 35 36 (see Fig. 1) will be found the bearings 37 38 for the worm-wheel shaft 39, which shaft will be again referred to in this description.

Number 40 designates the worm-wheel fixed upon shaft 39, and constructed and arranged to engage the worm 32.

41 marks the drum upon which the rudder-chains are to be wound.

In Fig. 1 appears also the standard 42, designed to support bearing 43, wherein rotates shaft 44. At one end of shaft 44 is fixed the pilot-wheel 45, and at the remaining end the sprocket-wheel 46 is attached. A sprocket-chain 47 transmits the rotative movement of the pilot-wheel to the reversing-valve gear. With the exception of the channeled sliding blocks adapted to be reciprocated within the transverse orifices of the cross-heads, the parts thus far described and numbered are of known construction and operation.

Sprocket-chain 47 joins sprocket-wheel 46 with a second wheel 48, which possesses a sprocket periphery 49 and an eccentric or cam groove 50. The wheel 48 fits the shaft 39 and may be rotated thereupon.

51 marks a curved block fashioned to fit and to travel the eccentric-groove 50. The curved block is provided with a transverse or fice 52 with expanding mouths and a longitudinal orifice 53. A pin 54 is held revoluble within the longitudinal orifice of block 51, and the pin is pierced transversely by an orifice which accommodates one leg 55 of a bell-crank lever. Both orifice and leg are ordinarily cylindrical, the latter fitting movably within the former.

56 marks the second leg of the bell-crank lever, and is constructed to be slightly flexible and to operate in a degree as a straight spring, as more fully set out hereinafter. The bell-crank lever has a pivotal orifice through which may be passed the pivot-bolt 57. Bolt 57 fills the additional office of joining the ends of the strap or clamp 58 which encircles shaft 39 and supports the bell-crank lever upon bolt 57. A set-screw 59, acting through the strap 58, fixes its position upon the shaft.

Number 60 designates a cylindrical bore, as my invention is usually constructed, extending from the inner end of shaft 39 axially toward its outer extremity, and a longitudinal slot 61 is cut from the surface of the shaft to the bore. A block 62 fits bore 60 movably, and is provided with a centrally-located threaded orifice for engagement with one valve-stem of the reversing-valve. The block 62 has also a transverse recess 63, usually arranged vertically, and suitable orifices in which a pin 64 is held revoluble across the transverse recess. The spring-leg 56 of the bell-crank lever already mentioned has in its outer end a recess 65 and the revoluble pin 64 is cut away upon both sides near its middle in order that it may be caused to engage the recess 65.

66 marks a second or auxiliary sprocket-wheel revoluble upon worm-wheel shaft 39, and it possesses a projection 67, attached by a bolt 68 to a similar projection from the wheel 48, already described. The two sprocket-wheels therefore rotate together when one is actuated, and either may be chained to the pilot-wheel sprocket, as desired.

Number 69 designates an extension of the hub of sprocket-wheel 66, and through the extension there is formed a helical cam-slot 70, extending but part way around it. (See also Fig. 6.) A nut 71 engages the threaded end of shaft 39 and serves to retain the sprocket-wheels in position upon the shaft and against the bearing 38, Fig. 1.

72 designates a second block movably fitting the bore 60 and placed between block 62 and the opening of the bore. Block 72 is provided with a central orifice interiorly threaded for engagement with a hollow valve-stem leading to one of the divisional slide-valves of the reversing device. Attached to block 72, or formed integral therewith and projecting from it, is a smaller block or lug 73, fashioned to engage and to travel the helical slot 70. In engagement with threaded orifice of block 62 is a solid valve-stem 74, and surrounding the solid stem is a hollow stem 75, having one end in engagement with the orifice of block 72. The outer stem, while movable upon the inner to a limited extent, fits the latter closely enough to render their meeting area steam-tight. The entrance of the outer stem into the reversing-valve steam-chest is through a stuffing-box of ordinary shape.

The reversing slide-valves consist of two similar members placed side by side, one of which, 76, (see Figs. 1 and 3,) has somewhat the greater superficial area presented to the pressure of steam within the chest, which acts in a valve of this character to hold the slide to its seat. To the slide-valve 76 the solid stem 74 is attached.

77 marks the smaller of the two members

of the reversing slide-valve, and it is attached to the hollow stem 75.

78 designates the reversing-valve steam-chest supplied with steam by pipe 79. (Shown in Fig. 1.) Inclosed in casing 80 are two ports or channels for conducting steam to the engines.

81 marks the forward steam-port shown in Fig. 1, and leads from steam-chest 78 to the ports 5 5, which would under ordinary circumstances of engine construction form the exhaust-ports. The rear port 82 admits steam to the engine steam-chests in the regular manner. It will be noticed that steam is taken by the engines alternately from outside and inside valves 17 and 23. Number 83 designates the exhaust-port of the reversing-valve.

In Fig. 1 it will be observed that solid stem 74 passes through a smooth orifice in divisional slide-valve 76, with which it is held in revoluble connection by bearing-collars 84 85, retained in position by split pins 86 87, inserted through the stem. Thus while reciprocating the valve the stem is at liberty to be rotated by means of its attachment to block 62.

The operation of my invention may be described as follows: The working of the engines is believed to be sufficiently set out in the drawings, taken in connection with the foregoing explanation. Starting with the various parts in the positions shown in Figs. 1 and 2, and the engines at rest, let the pilot-wheel be turned to rotate the top of wheel 48 from the observer. As both sprocket-wheels, being bolted together, move as one, blocks 62 72 will be moved toward the mouth of bore 60. Were the valve 76 and elements operating it employed alone the evil effect of wire-drawing the steam on its passage to the engines would result. When steam is admitted back of this class of valves, it renders their operation difficult by pressing them closely to their seats. By employing two valve members differing in superficial area, it will be understood that the smaller valve, being under less pressure, will be the more easily actuated. Valve 77 is the smaller in my invention, and the helical slot 70 is formed to move lug 73, block 72, hollow stem 75, and valve along its seat with uniform speed from the start. As one result, therefore, the open port always relieves the pressure upon the larger valve 76 at the outset. The bell-crank when operated, through intervening attachments, by eccentric-groove 50, moves block 62, stem 74, and valve 76 at first rapidly, then at slower uniform speed. That is to say, as the movement begins, valve 76 is delayed slightly by the excess of exterior steam-pressure, and the spring-leg 56 of the bell-crank lever bends to a certain extent before the valve starts and reacts to hasten its movement when just begun. This construction enables me to avoid, as far as practicable, passing steam to the engines through exceedingly narrow openings at the beginning of operations, which would result in a considerable loss of effective pressure.

Assuming both slide-valves 76 77 to be advanced and to uncover the port 82, and by the same movement opening port 81 into the exhaust-port 83, the left-hand engine will take steam from its own steam-chest, into which port 82 leads, behind its piston, exhausting the steam or air before the piston by way of ports 4 5 81 83 to condenser or atmosphere. The engines are thus started forward and continue working as long as the supply of steam is available in the ordinary manner. (See Figs. 1 and 2.)

Assuming both slide-valves 76 77 to be withdrawn and to uncover the port 81, and by the same movement opening port 82 into exhaust-port 83, the left-hand engine will take steam through port 5, into which port 81 is led, below slide-valve 17 by way of port 4 before the piston, exhausting steam behind the piston through port 3 into the steam-chest and thence by way of ports 82 83 to condenser. The engines are thus started backward and continue working as before until the supply of steam ceases.

Referring to the movement of the engines first assumed above, it will be observed that worm wheel and shaft 39 are caused to revolve tops from the observer, while a contrary action takes place in consequence of the second assumed movement of parts. After being turned to open either port, whereby the engines are started, the pilot-wheel is held at rest and the revolution of shaft 39 moves block 51 in the eccentric-groove of wheel 48, and lug 73 in helical slot 70, whereby valves 76 77 are brought back to their normal central position, as shown in Fig. 1, and the block 51 occupies a middle position between the extremes of travel possible to it in coöperating with the eccentric-groove 50, while the legs of the bell-crank lever are perpendicular to and parallel with the center line of the shaft.

I am aware that twin engines, worm and wheel gearing, and reversing-valve mechanisms are in use, and I do not claim those features, nor do I limit myself to the precise form, proportions, and arrangement of parts shown herein.

What I claim, and desire to protect by Letters Patent of the United States, is—

1. In a steam steering apparatus, the combination of a suitably-supported worm-wheel shaft, a wheel held revoluble upon said worm-wheel shaft, said wheel having an eccentric or cam groove, a pilot-wheel, connections whereby the conditions of rest or motion of said pilot-wheel may be imposed upon said grooved wheel, a block fashioned to travel said eccentric groove, a bell-crank lever having a fulcrum attached to said shaft and adapted to be revolved therewith, devices pivotally joining said block and bell-crank lever, a reversing-valve, pivotal and revoluble connections

between said bell-crank lever and reversing-valve, steam-engines arranged to rotate said worm-wheel shaft, steam and exhaust ports governed by said reversing-valve, said steam-ports arranged to serve steam to said engines causing them to rotate said worm-wheel shaft in a direction similar to that imposed upon said grooved wheel by said pilot-wheel, substantially as described.

2. In a steam steering apparatus, the combination of a suitably-supported worm-wheel shaft, a wheel held revoluble upon said shaft, said wheel having an extended hub, the said extension provided with a helical slot, a pilot-wheel, connections whereby the conditions of rest or motion of said pilot-wheel may be imposed upon said slotted wheel, a block having a lug fashioned to travel said helical slot, means for guiding said block, a reversing-valve, a valve-stem connecting said block and said reversing-valve, steam-engines arranged to rotate said worm-wheel shaft, steam and exhaust ports governed by said reversing-valve, said steam-ports arranged to serve steam to said engines causing them to rotate said worm-wheel shaft in a direction similar to that imposed upon said slotted wheel by said pilot-wheel, substantially as described.

3. In a steam steering apparatus, the combination of a suitably-supported worm-wheel shaft, a wheel revoluble upon said shaft, said wheel having an eccentric or cam groove, a pilot-wheel, connections whereby the conditions of rest or motion of said pilot-wheel may be imposed upon said grooved wheel, a block fashioned to travel said eccentric groove, a bell-crank lever having a fulcrum attached to said shaft and adapted to be revolved therewith, devices pivotally joining said block and bell-crank lever, a second or auxiliary wheel revoluble upon said worm-wheel shaft and having an extended hub, the said extension provided with a helical slot, the said grooved wheel and said auxiliary slotted wheel being attached to each other and arranged to be revolved together, a block having a lug fashioned to travel said helical slot, means for guiding said block, a reversing-valve consisting of two independent slide-valves of different superficial area, pivotal and revoluble connections between said bell-crank lever and the greater of said reversing slide-valves, a valve-stem joining the lesser of said reversing slide-valves and the block coöperating with said helical slot, steam-engines arranged to rotate said worm-wheel shaft, steam and exhaust ports governed by said reversing-valve, said steam-ports arranged to serve steam to said engines causing them to rotate said worm-wheel shaft in a direction similar to that imposed upon said grooved wheel by said pilot-wheel, and means for retaining said grooved and slotted wheels upon said shaft, substantially as described.

4. In a steam steering apparatus, the combination of a suitably-supported worm-wheel shaft having a bore extending axially from one end and a longitudinal slot, a wheel revoluble upon said shaft and provided with an eccentric or cam groove, a pilot-wheel, connections whereby the conditions of rest or motion of said pilot-wheel may be imposed upon said grooved wheel, a block fashioned to travel said eccentric groove, a bell-crank lever having a fulcrum fixed upon said shaft and adapted to revolve therewith, devices for pivotally joining said block and bell-crank lever, said lever having one leg possessing elasticity and constructed to enter said bore through the slot in said shaft, an auxiliary wheel revoluble upon said worm-wheel shaft and having an extended hub provided with a helical slot, said grooved and slotted wheels being attached to each other and arranged to revolve together, means for retaining said attached wheels upon said shaft, a reversing-valve consisting of two independent slide-valves of different superficial area, a block movably fitting said bore and pivotally attached to the elastic leg of said lever, a block movably fitting said bore and provided with a lug fashioned to travel said helical slot, a solid valve-stem forming a revoluble connection between the first-mentioned block in said bore and the greater of said reversing slide-valves, a hollow valve-stem movably inclosing said solid stem and joining the second-mentioned block in said bore with the lesser reversing slide-valve, and mechanism governed by said reversing-valve whereby said worm-wheel shaft may be rotated in a direction similar to the rotation imposed upon said grooved wheel by said pilot-wheel, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHAUNCY B. PERLEY.

Witnesses:
D. H. CAMERON,
O. L. JENKS.