W. F. GOULD.

BALANCED SLIDE VALVE.

APPLICATION FILED FEB. 12, 1906.

912,372.

Patented Feb. 16, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

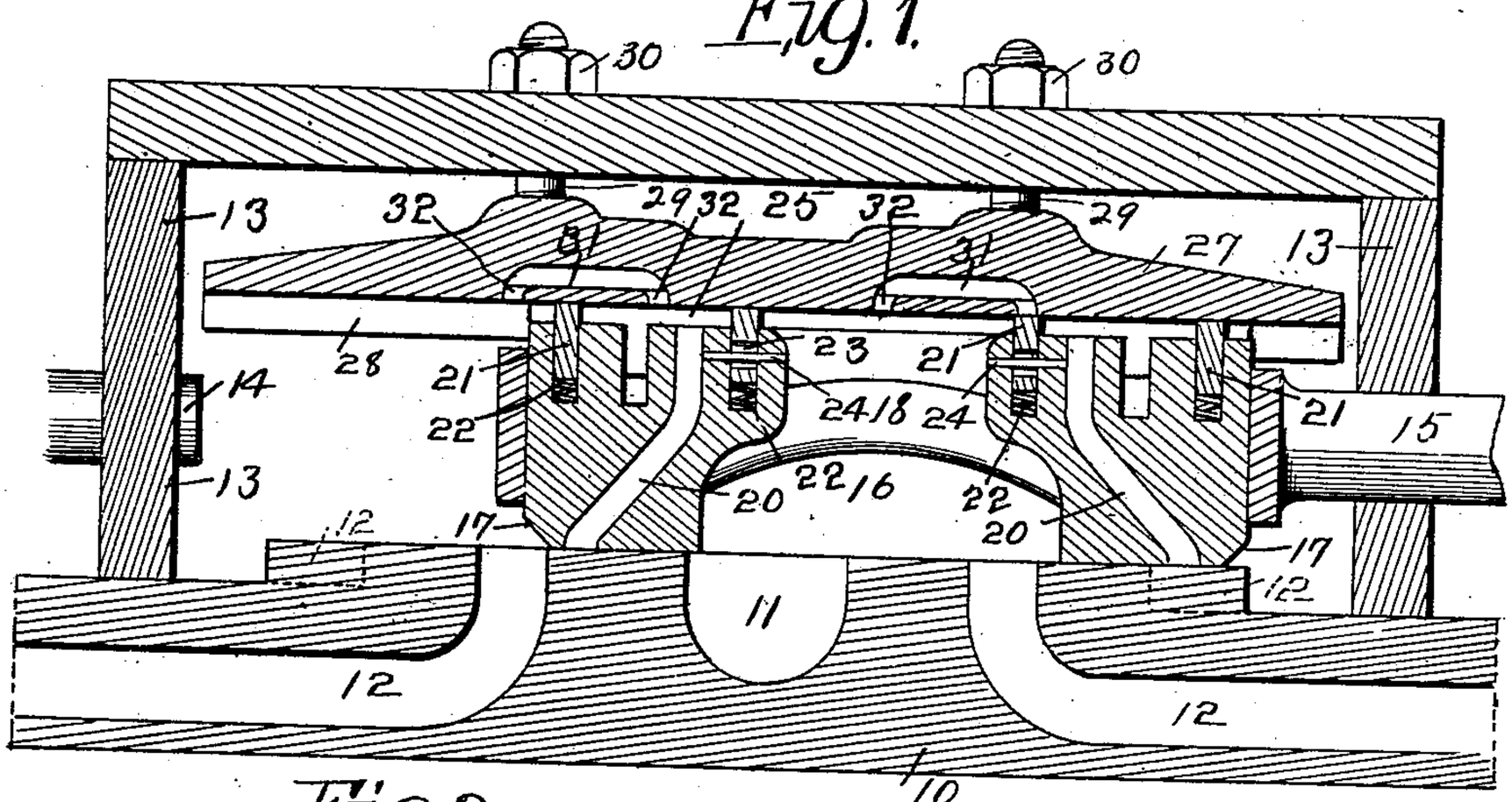


Fig. 2.

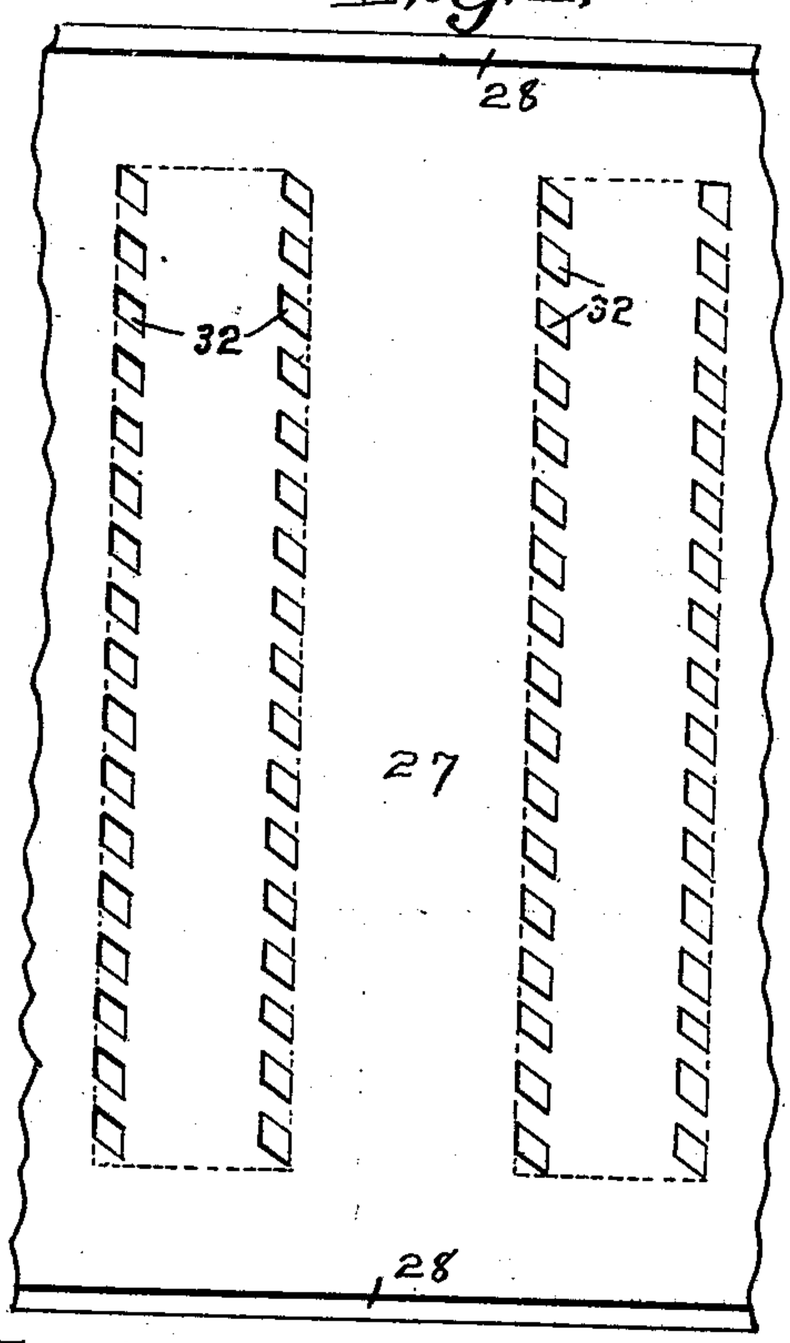
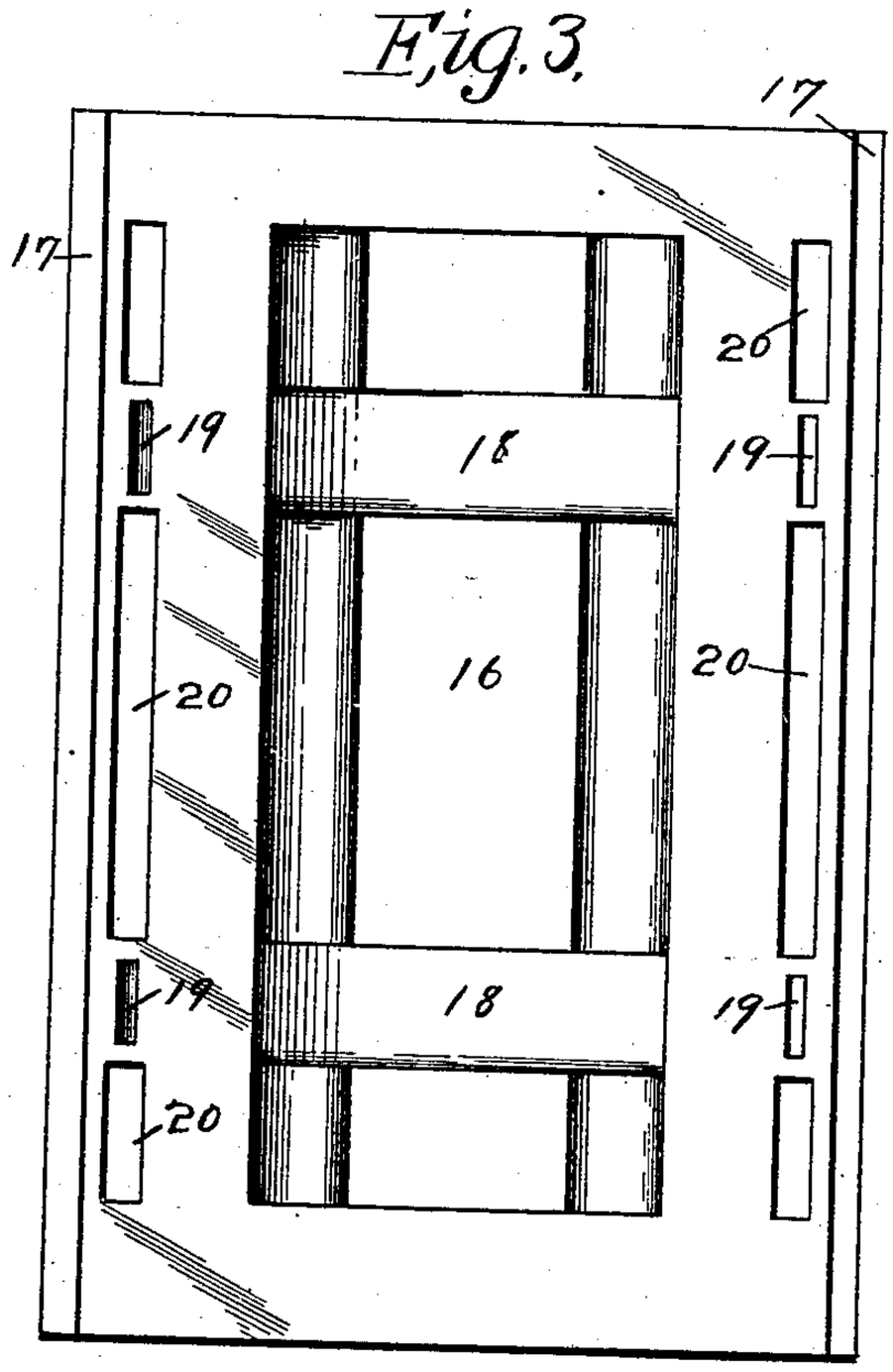


Fig. 3.



Witnesses
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2 SHEETS—SHEET 2.

Fig. 4.

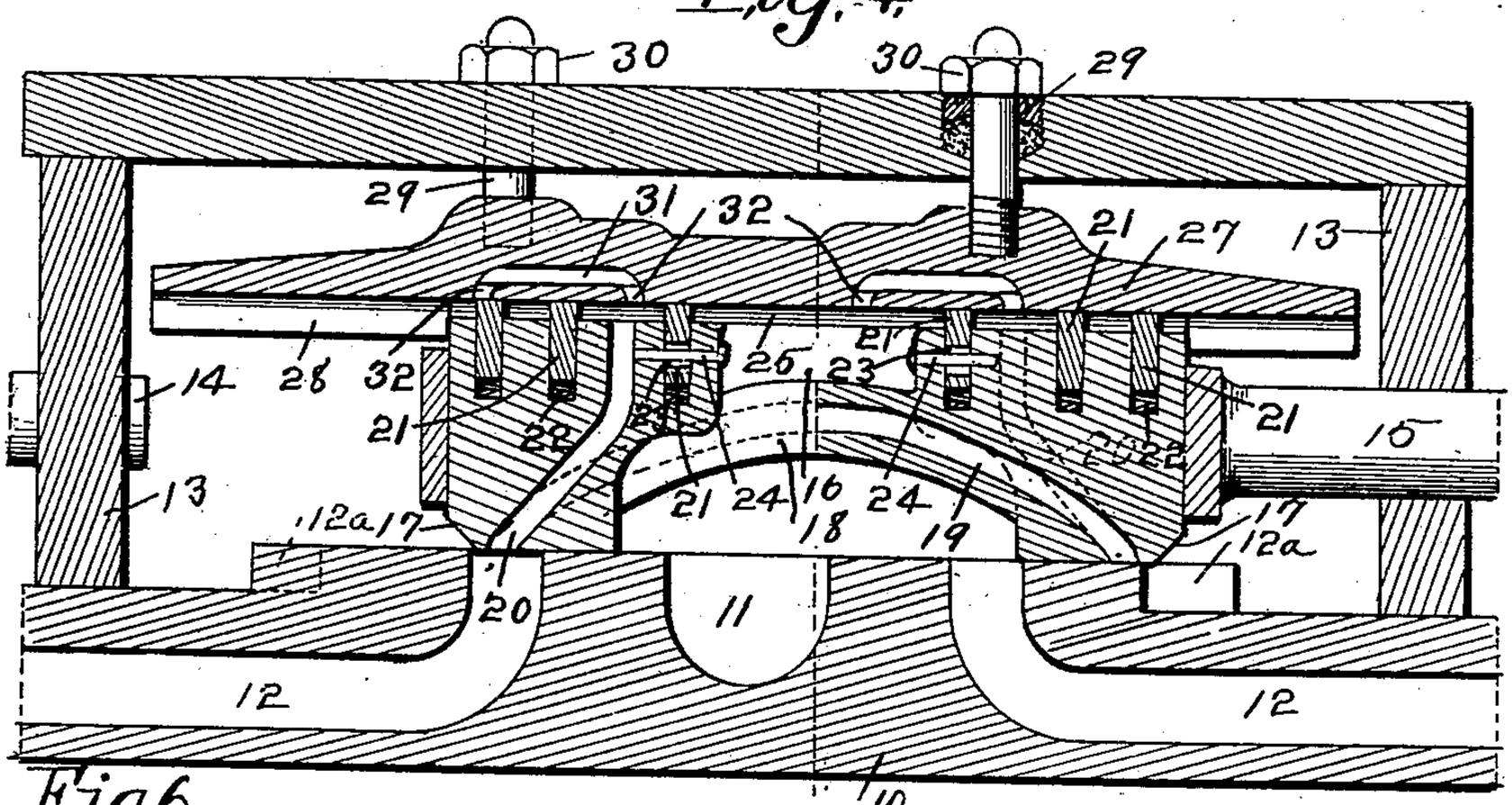

Fig. 6.

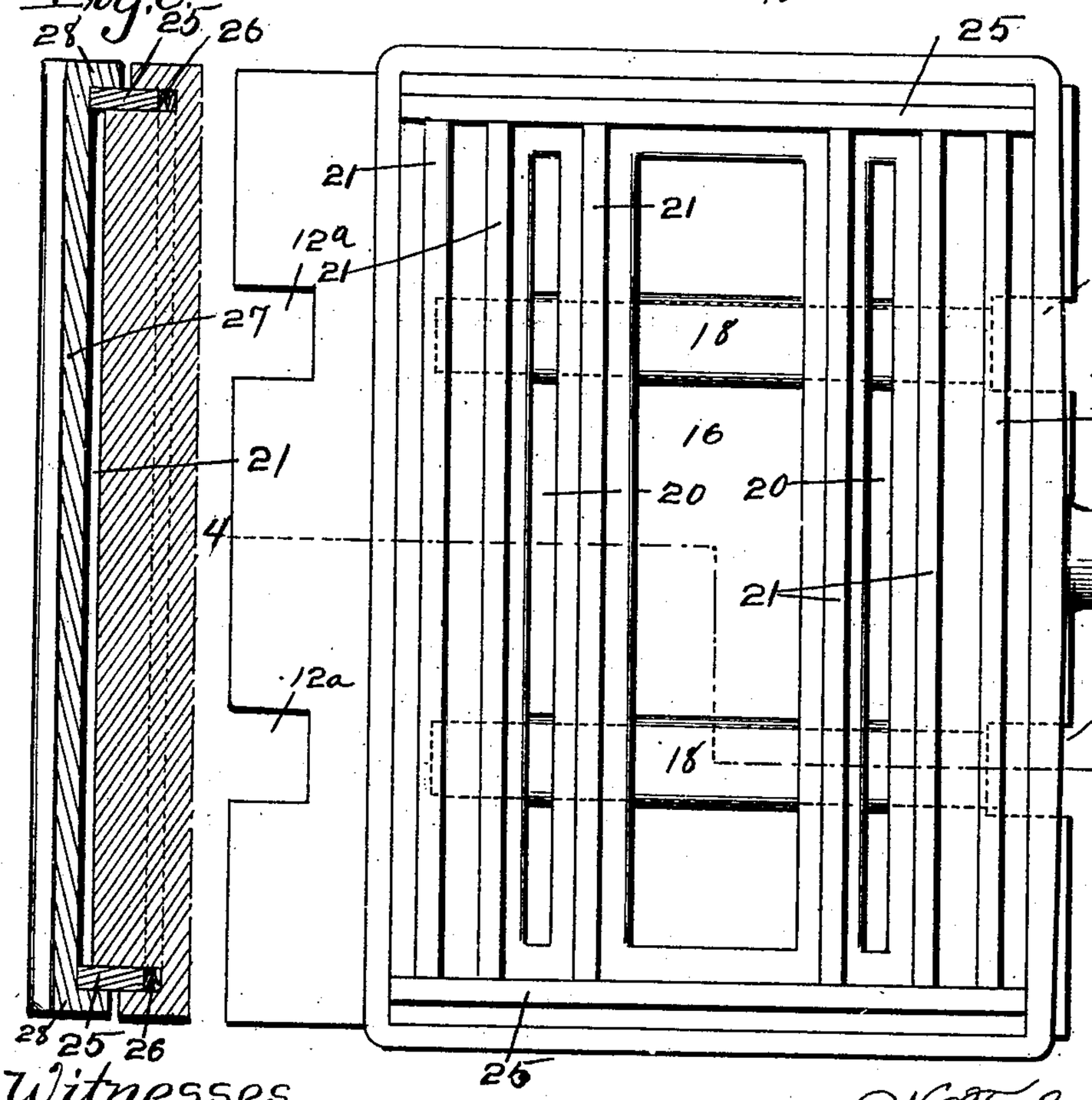

Fig. 5.

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UNITED STATES PATENT OFFICE.

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BALANCED SLIDE-VALVE.

No. 912,372. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed February 12, 1906. Serial No. 300,784.

To all whom it may concern:

Be it known that I, WILLIAM F. GOULD, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented a certain new and useful Balanced Slide-Valve, of which the following is a specification.

The object of my invention is to provide a slide valve for engines, of simple, durable and inexpensive construction, in which the steam pressure is so counterbalanced as to permit the slide valve to operate with a minimum of friction and wear.

A further object is to provide a valve of this class in which the parts may be so adjusted as to cause the steam to exert a slight pressure on the valve tending to hold it to its seat to thereby prevent leakage of steam between the valve and seat in case the valve seat should be worn or uneven.

A further object is to provide a valve of this class with means whereby communication may be provided between both the cylinder induction ports and the exhaust port at the same time, so that if water of condensation has accumulated in the cylinder, the engine may be operated to discharge same.

My invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a central, longitudinal, sectional view of a portion of a cylinder and a steam chest thereon containing a slide valve and valve cover embodying my invention, the valve being shown at the inner limit of its movement. Fig. 2 shows a plan view of the inner surface of the valve cover. Fig. 3 shows a plan view of the inner surface of the valve. Fig. 4 shows a longitudinal, sectional view on the line 4—4 of Fig. 5, and also illustrating a portion of the cylinder and steam chest and valve cover. Fig. 5 shows a plan view of the slide valve and a portion of the cylinder adjacent thereto, and Fig. 6 shows a sectional view on the line 6—6 of Fig. 5.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the portion of the steam engine cylinder shown. It is provided with the ordinary centrally arranged exhaust port 11 and two induction ports 12 adjacent thereto. On the cylinder adjacent to these ports is a raised working face upon which the valve slides and in this face I have formed at the ends thereof the notches 12^a as shown in Fig. 5, for purposes hereinafter made clear. The steam chest is indicated by the numeral 13 and the steam induction pipe 14 enters it at one end.

The slide valve proper comprises a rectangular body portion, flat on its face, that engages the cylinder and also on its outer face. Connected with the slide valve is the valve rod 15 which projects through the steam chest. A chamber 16 is formed in the central portion of the valve extending from its inner to its outer surface and from a point near one side to a point near the opposite side, said chamber being large enough on its inner portion to overlap at the same time the port 11 and one of the ports 12 of the cylinder. The corner of each end of the valve adjacent to the cylinder is beveled at 17, for purposes hereinafter made clear. Extending across the chamber 11 of the valve are two tubes 18 and communicating with these tubes are the passageways 19 which lead from the inner or working face of the valve close to one end thereof, to a similar point close to the other end. The ends of the passageways 19 are positioned to register with the notches 12^a in the cylinder during certain portions of the valve stroke, as clearly shown in Fig. 5. I have also provided a series of passageways 20 formed in the valve, their inner ends opening at the inner surface of the valve in line transversely with the passageways 19. These passageways 20 extend from the inner face of the valve toward the outer face and also toward the center of the valve and are open at both ends.

Formed in each end portion of the valve on the outer face thereof are three transverse grooves, the inner and outer ones being arranged as close to the edges of the part in which they are formed as is consistent with safety and durability. The outer edge of the groove near the outer end of the valve being arranged in line with the inner edge of the beveled portion 17 as clearly shown in Fig. 1. Arranged in each one of these transverse grooves is a packing bar 21 and beneath each packing bar are the extensible

springs 22. In this connection I have provided for limiting the movement of the packing bars nearest the center of the valve, by forming in each of said bars a slot 23 and extending a pin 24 through it into the adjacent portions of the valve. Extended across each side of the valve are the packing bars 25 having the springs 26 to force them outwardly, said bars 25 being in engagement with the ends of the bars 21. These packing bars on the outer face of the valve are designed to engage and form a steam tight connection with a valve cover which comprises a flat plate 27 having at its side edges the downwardly projecting ribs 28, which ribs lie close to the packing bars 25 to form steam tight connection therewith. The valve cover is supported a slight distance from the outer face of the valve by means of the bolts 29, screwed into the valve cover and passed through the steam chest and made adjustable toward and from the valve by the nuts 30. In this way the cover is normally held in position adjacent to the valve, but either end may be tilted slightly away from the valve. Formed in each end portion of the cover is a chamber 31 extending across the cover to points near the side edges thereof and provided with ports 32 open on the inner face of the cover. The said openings 32 are preferably arranged diagonally relative to the cover, as clearly shown in Fig. 2, as in this way the wear upon the packing bars engaging this portion of the cover will be uniform. The rows of perforations 32 at each end portion of the cover are so positioned with relation to the packing bars 21 and the passageway 20 that, when the valve is in the position shown in Fig. 4 and is moving toward the right, steam will be admitted into the interior of the steam chest through the ports 32, through the chamber 30, into the space between the two inner packing bars and then through the port 20, into the port 12, at the same time, or slightly before, steam may enter from the steam chest directly into the port 12. I have also provided means whereby communication may be established between the cylinder port 12 and the exhaust port 11, as follows: If the cylinder port 12 is covered by the portion of the valve adjacent to it and in the event that there should be a strong pressure within the cylinder, such as might be caused by an accumulation of water therein, and if the inner end of the passageway 20 is in communication with the port 12, then a pressure of water in an outwardly direction through the port 12 would cause the water to flow through the port 20 and be confined in the space between the two adjacent packing bars 21, this would cause the adjacent end of the cover 27 to be moved away from the valve, the two outer packing bars 21 would follow the cover on account of the springs, while the inner packing bar would have its movement limited by the pin 24 and hence this water could then pass over the inner bar 21 and into the exhaust opening. In this way, the cylinder could relieve itself of water.

In practical use, it will be noted that, by means of the construction shown and described, a valve is provided that will operate with a minimum of friction and wear. The steam pressure inwardly upon the end portions of the valve beyond the packing bars will be balanced by the outward pressure upon the beveled portions 17. The steam pressure that is exerted upon the valve in a direction away from the cylinder when the valve is adjacent to the port 12 is counterbalanced by the steam pressure upon the outer surface of the valve between the inner and the middle packing bars 21 which steam reaches this space either through the ports 32 or the ports 20 so that at all times when the valve is over the port 12 a counterbalancing steam pressure of substantially equal amount is provided between the inner pair of packing bars 21 of the same end of the valve. In this connection it may be explained that in some instances where the working face of the cylinder is uneven or worn, it is desirable to provide a pressure upon the valve tending to force it toward its seat and when this is desired, I accomplish the result by simply removing the central packing bar 21 at each end of the valve and in this way I increase the space upon which the steam presses against the outer face of the valve without changing the relative pressure upon the inner face and I, therefore, obtain a steam pressure firmly holding the valve to its seat. I also provide a valve in which the steam is admitted to the port 12 very quickly when said port begins to open to the steam chest by providing for the admission of steam into it from three separate and independent sources: First, the steam is admitted direct from the steam chest into the port 12 as soon as the valve begins to uncover the port. Second, steam is admitted through the notches 12^a on the opposite side of the valve through the passageways 19, and third, through the ports 32, the passageway 31 and the passageway 20. In this way a quick acting valve is provided.

In the drawings, the valve stem 15 and the ports 29 are illustrated as passing through the walls of the steam chest and no packing glands for them are shown. These parts necessarily have a sliding movement relative to the steam chest and, therefore, there would be an escape of steam around them if no packing glands were used. In practice it is intended that suitable packing glands shall be provided for these parts, which packing devices may be of any of the ordinary kinds now in common use.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, therefor is—

1. The combination with a cylinder having exhaust and inlet ports and a raised working face adjacent thereto provided with notches in its end portions and a slide valve formed with a passageway designed in one position to communicate between the notches at one side of the valve and the steam inlet port of the cylinder at the other side thereof said valve formed on its outer face with a steam chamber, a valve cover forming part of said steam chamber, said valve provided with a passageway communicating between the said steam chamber and the lower face of the valve, said passageway designed to rest on top of the working face of the valve seat out of communication with said notches when the valve is in position with said passageway in transverse alinement with said notches.

2. A slide valve, a cover therefor, a steam chamber formed between the valve and cover, said parts being so arranged that steam admitted into said chamber will tend to hold the valve toward its seat, and a passageway formed in the valve cover for admitting steam into said steam chamber at the time when the valve is in position for admitting steam into the induction port.

3. A slide valve, a cover therefor, three packing bars at each end of the valve normally projecting beyond the outer face thereof, springs for forcing said bars outwardly, a yielding cover engaged by said bars, the central one of said bars being detachable and said valve formed with a passageway leading from its outer face between the two inner bars to the working face of the valve.

4. The combination of a yielding valve cover, a slide valve under the cover having a centrally arranged exhaust opening extending from its inner to its outer face, packing bars extending across each end of the valve to engage the cover, said packing bars movable toward and from the cover, means for limiting the movement of the inner bar at each end and said valve formed with a steam passageway extending from the outer face of the valve at each end to the inner face of the valve.

5. The combination of a steam chest, a valve cover therein, bolts secured to the valve cover slidingly extended through the steam chest, nuts on their outer ends, a slide valve having a centrally arranged exhaust chamber extending from its inner to its outer face, a series of transverse packing bars across each end of the slide valve, said packing bars movable toward and from the cover, means for limiting the movement of the packing bars at each end nearest the center of the valve, said valve formed with passageways extended from the outer face of the valve at each end to the inner face thereof.

6. The combination of a valve having packing bars extended transversely across its face to form steam chambers between them, said valve having a steam passageway leading from said steam chamber to the under face of the valve, a valve cover forming part of said steam chamber, said valve cover formed with transverse steam chambers, and with ports at the edges of said steam chambers leading to the under surface of the valve cover, said ports being so arranged with relation to the valve, that when the valve is in certain positions, steam may be admitted from the steam chest through said ports and through said transverse steam chambers, into the steam chambers between the packing bars on the valve and to the under surface of the valve.

7. The combination of a cylinder formed with an exhaust port and two steam inlet ports and having a raised working face adjacent to said ports formed with notches in the end portions of said raised face, a slide valve having a central exhaust chamber extended from its inner to its outer face, two tubes extending from one end of the valve to the other, said valve formed with passageways communicating with the tubes and with the inner face of the valve adjacent to its ends, said passageways shaped to receive steam through the notches in the working face of the cylinder at one end and discharge it into the inlet port adjacent to the other end of the valve thereof when the valve is in one position of its movement, a number of transversely arranged packing bars at each end of the valve, said valve formed with passageways extending from the outer face of the valve between said packing bars to the inner face of the valve adjacent to the end thereof to communicate with the cylinder inlet port and a valve cover engaging said packing bars and formed with passageways arranged to provide communication from a point outside of the packing bars to a point between them when the slide valve is in position partially uncovering the cylinder inlet port.

8. The combination of a valve having packing bars extended transversely across its outer portion, and forming steam chambers between them, longitudinal packing bars on the outer face of the valve, to form the sides of said steam chambers, a valve cover, ribs projecting inwardly from the valve cover to engage the outer side face of said longitudinal packing bars, said parts so arranged that the steam pressure within the chambers will force the longitudinal packing bars outwardly against said ribs, to form steam tight joints.

9. The combination of a valve having

packing bars extended transversely across its outer portion, and forming steam chambers between them, longitudinal packing bars on the outer face of the valve, to form the sides of said steam chambers, a valve cover, ribs projecting inwardly from the valve cover to engage the outer side face of said longitudinal packing bars, said parts so arranged that the steam pressure within the chambers will force the longitudinal packing bars outwardly against said ribs to form steam tight joints, said slide valve formed with a passage-way leading from the steam chamber on its outer face, to its inner face, where it may communicate with the induction port of a valve seat.

10. The combination of a slide valve with transverse packing bars projecting beyond its outer face and longitudinal packing bars on its side edges, a valve cover having inwardly projecting ribs at its side edges to engage said longitudinal packing bars, said cover also formed with a transverse chamber in each end portion and with diagonally arranged openings at each end of each chamber communicating between the chamber and the inner face of the cover.

11. The combination of a valve, a valve seat having induction and exhaust ports, a valve cover, a steam chamber formed between the valve and cover and so arranged that steam admitted therein will tend to force the valve toward its seat, said valve cover being formed with a passage way designed to admit steam into said chamber at the time when the valve is in position for admitting steam into the induction port.

12. A slide valve, a cover therefor, three packing bars at each end of the valve projecting beyond the outer face thereof, the central one of said bars being detachable, said valve cover being formed with a passage way designed to admit steam into the space between the two inner ones of said packing bars.

Des Moines, Iowa, February 1, 1906.

WILLIAM F. GOULD.

Witnesses:

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J. RALPH ORWIG.