No. 621,460. Patented Mar. 21, 1899.

A. & D. MURPHY.

STEAM ENGINE.

(Application filed Apr. 18, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

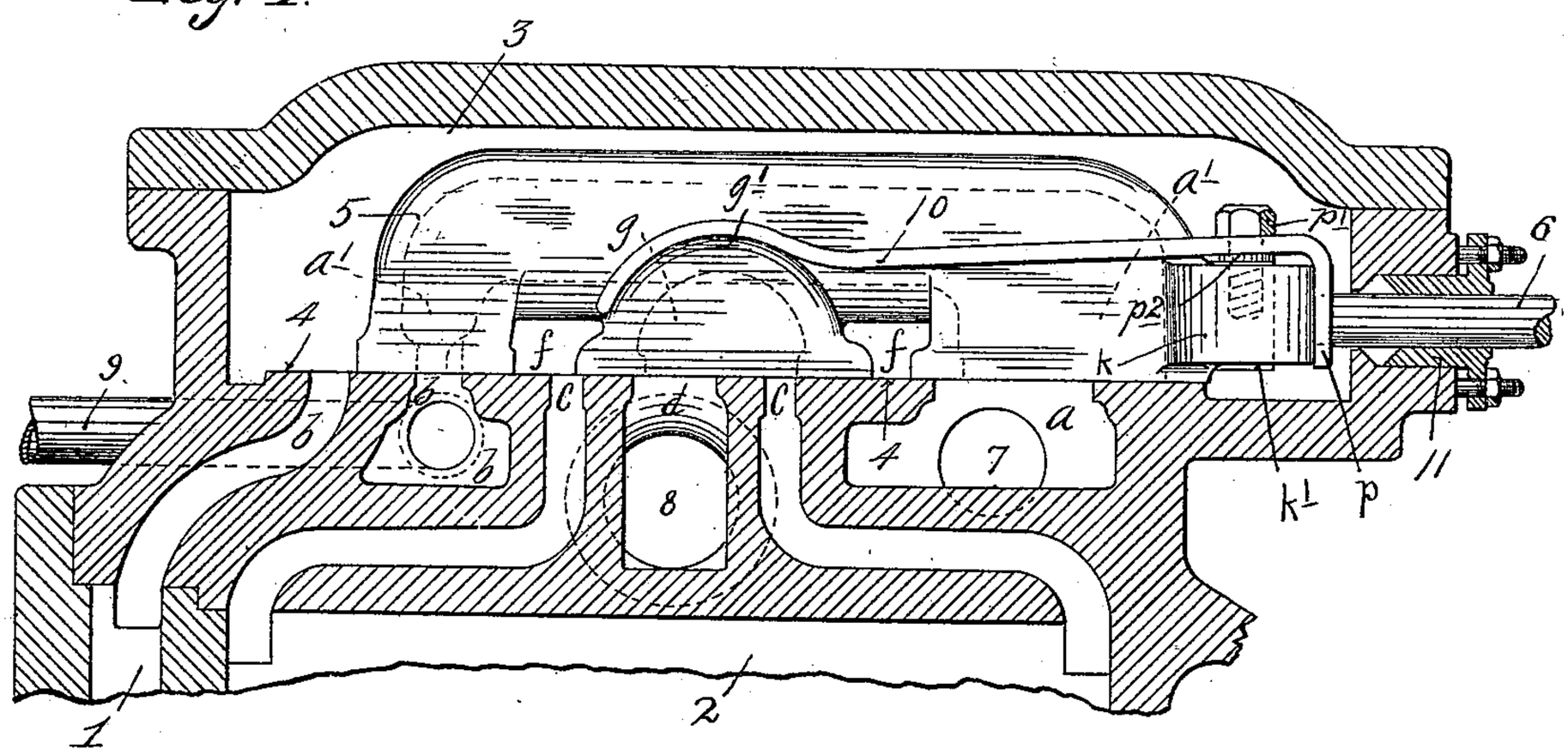


Fig. 2.

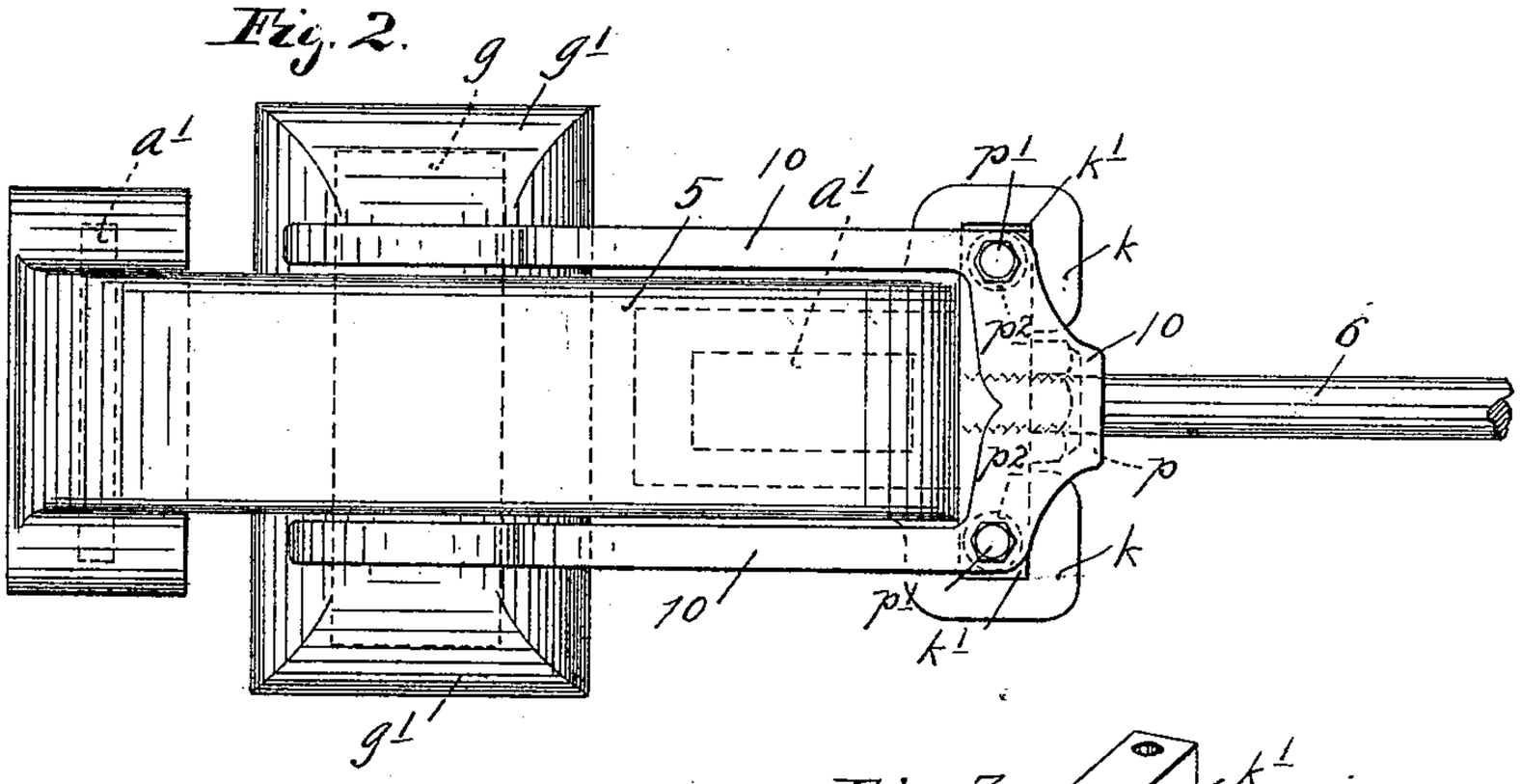


Fig. 3.

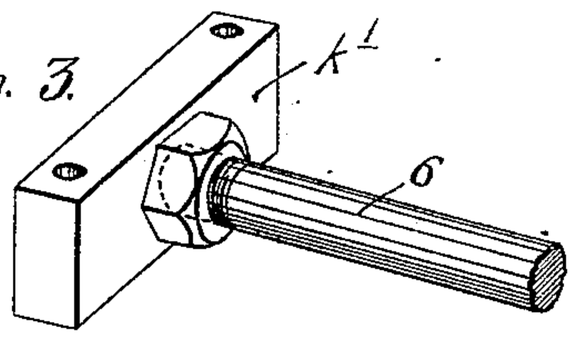
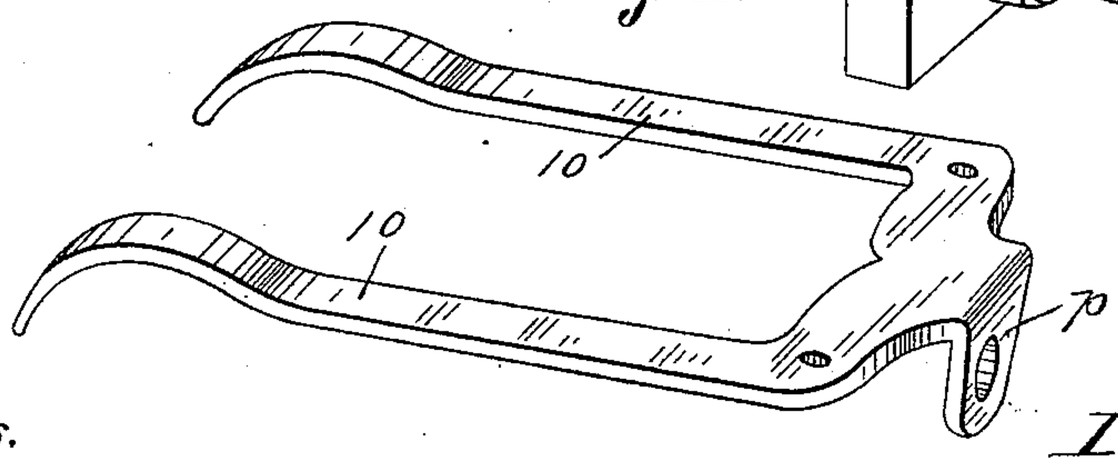


Fig. 4.



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Jas. F. Williamson

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(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

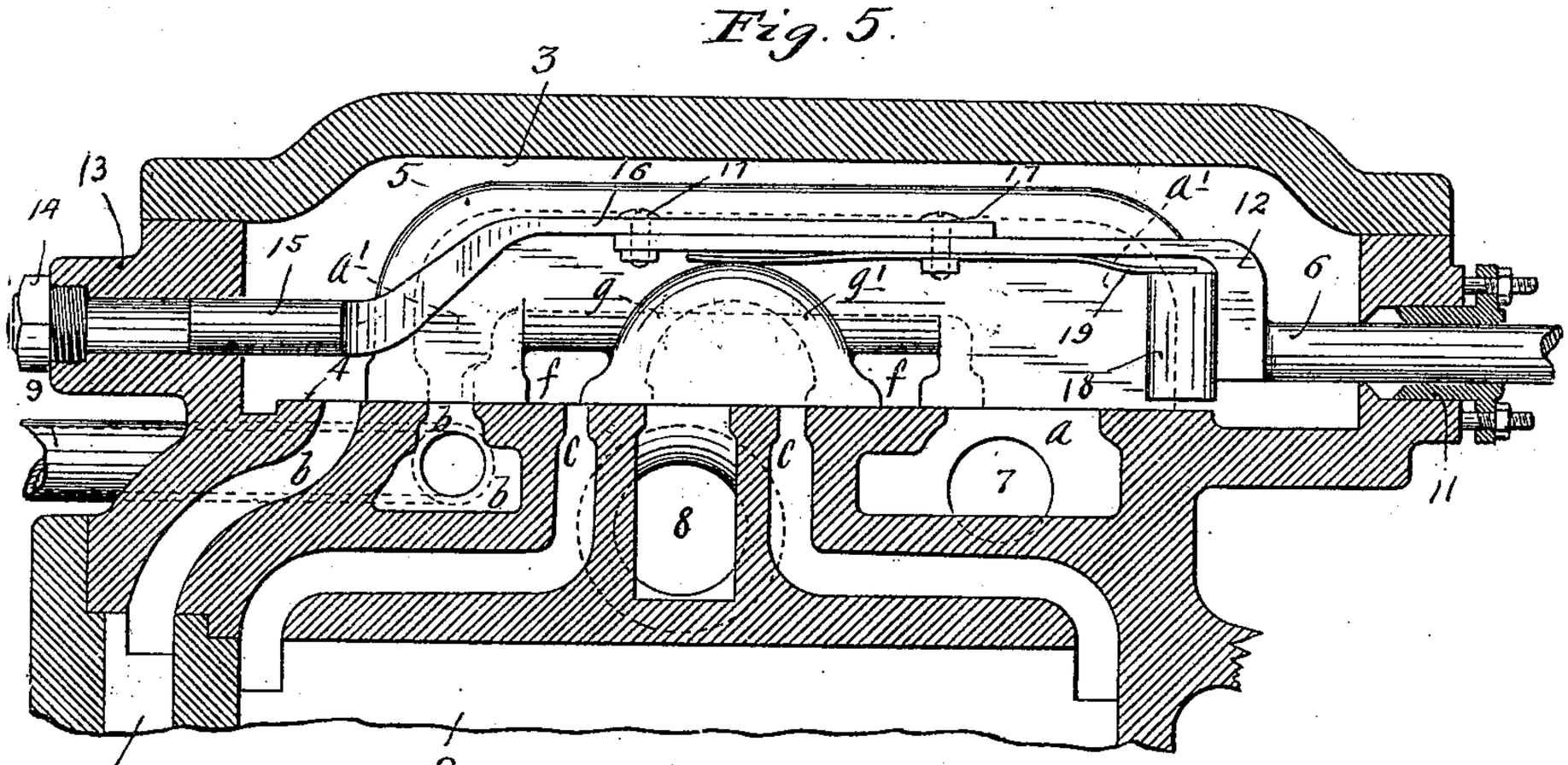


Fig. 6.

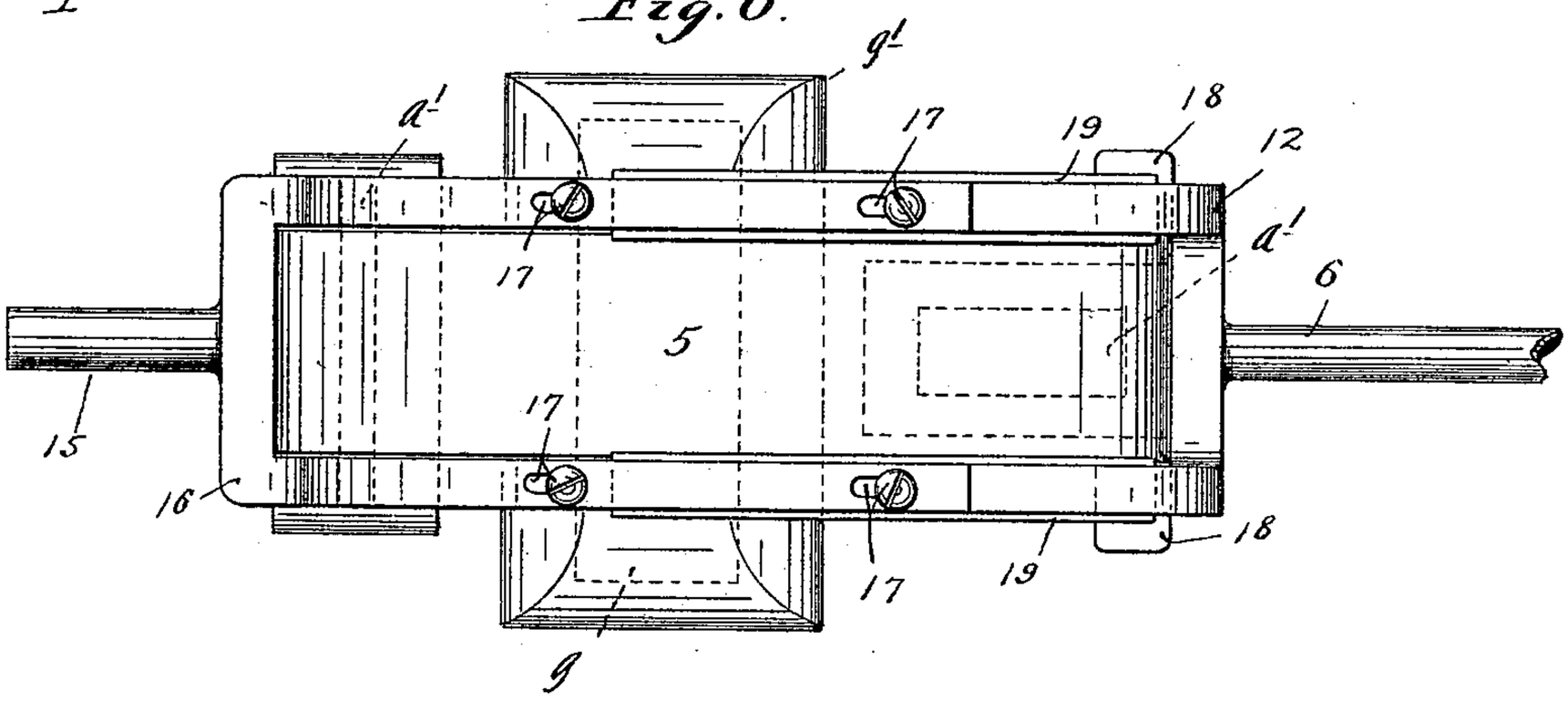
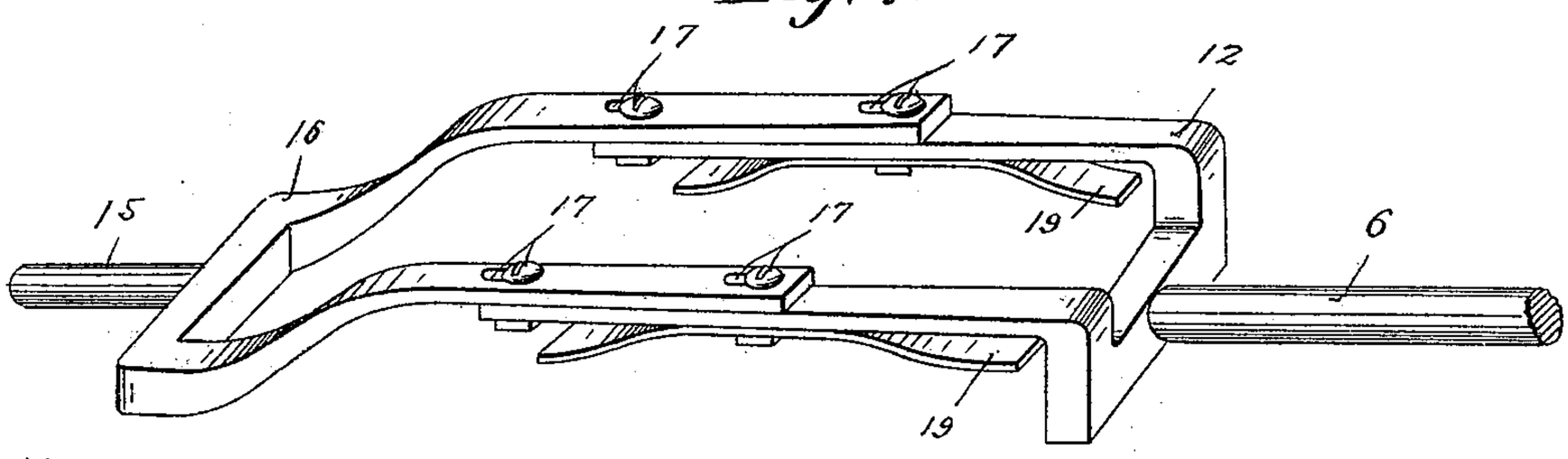


Fig. 7.



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UNITED STATES PATENT OFFICE.

ANDREW MURPHY AND DANIEL MURPHY, OF WASHINGTON LAKE, MINNESOTA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 621,460, dated March 21, 1899.

Application filed April 18, 1898. Serial No. 677,914. (No model.)

To all whom it may concern:

Be it known that we, ANDREW MURPHY and DANIEL MURPHY, citizens of the United States, residing at Washington Lake, in the county of Sibley and State of Minnesota, have invented certain new and useful Improvements in Steam-Engines; and we do hereby 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.

Our invention relates to engines, and was especially designed to effect a certain improvement in what is known as the "Woolf compound engine." In the said compound engine the valve is located in the receiver for the low-pressure fluid, and the ports in the seat and in the valve are so disposed that the high-pressure fluid is distributed from a limited area underneath the valve and that the low-pressure fluid is distributed through ports which open to the valve-chest under the control of the valve. Hence by properly proportioning the parts the pressures on the opposite sides of the valve may be substantially equalized under normal conditions, so that the valve will operate substantially as a balanced valve. With this construction, however, some difficulty has been experienced under some conditions in keeping the valve down to its seat. Sometimes the pressures do not balance. Our invention has for its object to meet this condition and overcome this difficulty, and we accomplish this result by the provision of a device for coöperation with the valve and valve-stem which will hold the valve down to its seat at all times. To this end we provide a spring which is carried by the valve-stem and bears upon the valve with the effect of holding the valve to its seat.

One form of our invention is illustrated in the accompanying drawings, wherein like notations refer to like parts throughout the several views.

Figure 1 is a sectional elevation of an engine equipped with our improvement, some parts being broken away. Fig. 2 is a plan view of the valve and attachment removed. Fig. 3 is a perspective view of a part of the valve-stem, and Fig. 4 is a perspective view of the spring or attachment detached. Fig. 5 is a view corresponding to Fig. 1, but illustrating a modified form of the spring device. Fig. 6 is a view corresponding to Fig. 2, but illustrating the modification shown in Fig. 6; and Fig. 7 is a perspective view of the spring device removed.

The numerals 1 and 2 represent, respectively, parts of the high and the low pressure cylinder-castings, which are arranged tandem and suitably connected together.

The numeral 3 represents the valve-chest, the numeral 4 the valve-seat, the numeral 5 the valve, and the numeral 6 the valve stem or rod.

The valve-seat 4 is provided with a supply-port *a* near one end of the same, with a pair of high-pressure ports *b* adjacent to each other near the opposite end of the seat, with a pair of low-pressure ports *c* on opposite sides of the center of the seat, and with the final exhaust-port *d* located at the center of the seat. The valve 5 is provided with a supply port or passage *a'*, extending through the valve longitudinally thereof, which passage or port *a'* in the said valve always communicates at its receiving end with the supply-port *a* of the seat and coöperates at its opposite or delivery end with the high-pressure ports *b* in the seat under the travel of the valve for distributing the high-pressure fluid from the limited area underneath the valve. The valve 5 is also of such construction as to afford passages *f*, which are always in communication with the valve-chest 3 or receiver for the low-pressure fluid, which passages *f* coöperate with the low-pressure ports *c* in the seat to distribute the low-pressure fluid from the chest 3 to the opposite ends of the low-pressure cylinder under the travel of the valve. The said valve 5 is also provided with the central exhaust-cavity *g* for coöperation with the low-pressure ports *c* and the final exhaust-port *d* in the seat to effect the final exhaust of the fluid. The inlet from the fluid or high-pressure supply pipe is shown at 7. The outlet for the final exhaust is shown at 8. The inner member of the pair of high-pressure ports *b* leads to the outer end of the high-pressure cylinder

through a pipe 9, as shown; but the passage, of course, might be in the cylinder-casting. With this construction it is obvious that the high-pressure fluid is distributed from a limited area underneath the valve and that the low-pressure fluid is available over the top of the valve in the distributing action. Hence by properly proportioning the parts, as hitherto noted, the valve may under normal conditions be substantially balanced by the fluid itself in the course of distribution. Under some conditions, however, the low pressure in the valve-chest 3 may not be sufficient to hold down the valve against the high pressure working against certain portions of the face of the valve. Hence to hold down the valve under such circumstances we provide a spring which is carried by or mounted so as to get its base of resistance on the valve-stem and to bear on the valve and operate to hold the valve to its seat. Various constructions can be described which will accomplish this result. In the drawings we have shown two extremely simple forms, one adapted for convenient application to engines already built and in use and the other to new constructions. According to the first design we supply a forked or two-pronged spring 10 and attach the same to the valve-stem, as shown in Figs. 1 and 2, with the head or body of the spring made fast to the valve-stem and the prongs or fingers applied to the laterally-extended parts of the valve 5. The valve 6 as made for the above-described engine is ordinarily provided with jaw-lugs k at one end, and the valve-stem 6 is provided with a head k', adapted to engage the said jaws k on the valve for operating the valve, while permitting the valve to move crosswise of the stem, as required. To adapt our device to this construction, the body of the spring 10 is provided with a downturned flange 9, properly perforated to permit the passage of the valve-stem. The stem-head k' works on the rod as a nut. The body of the spring 10 is made fast to the head k' by set-screws p' or other suitable means working through washers p^2. The stem 6 is then applied to the head k' by passing the same through the hole in the flange p before engaging the stem with the nut or head k'. The laterally-projecting parts g' of the body of the valve 5 are higher than the head k' of the valve-stem when the parts are in working position. Hence the prongs or fingers of the spring 10 will bear down on the said portion g' of the valve when the body of the spring is made fast to the head-block k' of the stem, as described, when the valve-stem is properly held and guided by the stuffing-box 11. As the spring is carried with the valve-stem at all points of its travel, it is obvious that the same will therefore operate to hold the valve down to its seat.

By the use of the washers p^2 of the proper number or size the pressure from the spring on the valve may be adjusted as desired for the work required. The prongs or fingers of the spring 10 are made quite stiff, and the spring is so set that when the valve is properly seated only a comparatively small amount of pressure will be applied thereto by the said spring; but if the valve tends the least bit to leave its seat under the unequal pressures from the fluid in the course of distribution the full strength of the spring will become instantly available to hold the valve in its normal position. By actual usage we have found that this device will do the work for which it was designed. Instead of this form other forms may be readily substituted to accomplish the same result. Any construction wherein the spring is carried by or gets its base of resistance on the valve-stem for operation on the valve to hold the same down to its seat is within the scope of our invention.

In the construction illustrated in Figs. 5, 6, and 7 the valve stem or rod 6 is provided with a bifurcated head 12, the prongs of which are adapted to embrace and closely fit the sides of the valve 5. The steam-chest 3 is provided in its end opposite to the stuffing-box 11 with a cylindrical seat 13, the outer end of which is normally closed by a steam-tight plug 14. The stem 15 of a forked or pronged section 16 works freely in the seat 13. The prongs of this fork 16 also embrace the sides of the valve 5, and they are adjustably secured to the prongs of the bifurcated head 12 by means of screw-and-slot connections 17. These pronged sections 12 and 16 are so adjusted that they will hold the valve in proper alinement or, in other words, will prevent said valve from rotating on its seat. At the same time the valve is free to move vertically, so far as these pronged portions are concerned. In this construction the valve is provided with a pair of projecting lugs 18 at its stem end. A pair of double-ended leaf-springs 19 are secured, one to each prong of the bifurcated head 12, as shown, by means of the screws or bolts of the connections 17. The forward ends of these springs 19 bear upon the lugs 18 and the rearwardly-projecting ends bear upon the lateral projections g' of the said valve 5. The action of this spring device is very similar to that of the device previously described; but it will be noted that in this instance the spring-pressure is applied to four different points on the valve instead of at two points only, as illustrated in the said prior construction. The rectangular frame formed by the pronged sections 12 and 16 will, however, hold the valve in much better alinement than the construction illustrated in Figs. 1 to 4, inclusive. This is due to two causes—to wit., the valve cannot possibly rotate with respect to the said parts 12 and 16, and the said parts 12 and 16, being tied together and mounted in bearings at both ends, cannot possibly rotate in a horizontal plane. This latter construction is probably the most efficient of the two, but has the disadvantage that it cannot be readily applied to existing

engines. In constructing new engines or new cylinders and steam-chests this latter construction would be preferable to the former. For the purposes of this specification and the claims the pronged parts 12 and 16 and projection 15 are treated as parts of the valve stem or rod.

What we claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a valve and a stem connected thereto with freedom for the movement of said valve to and from its seat, of a spring reacting against said parts and pressing the valve to its seat against said stem as a base of reaction, substantially as described.

2. The combination with a slide-valve and its valve-stem, said valve being free for movement to and from its seat, of a pronged spring secured to said valve-stem and embracing and engaging said valve to hold the same to its seat, substantially as described.

3. The combination with the valve 5 and its stem 6, said valve being free for movement to and from its seat, of the supplemental valve-stem 15, and the prongs 12, 16, respectively from said valve-stems 6 and 15 adjustably secured together and provided with springs 19 that engage said valves, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ANDREW MURPHY.
DANIEL MURPHY.

Witnesses:
THOMAS THOMPSON,
ARNOLD SCHAEFER.