No. 844,388. PATENTED FEB. 19, 1907.

M. A. NEELAND.

COMPOUND ENGINE.

APPLICATION FILED APR. 21, 1906.

5 SHEETS—SHEET 1.

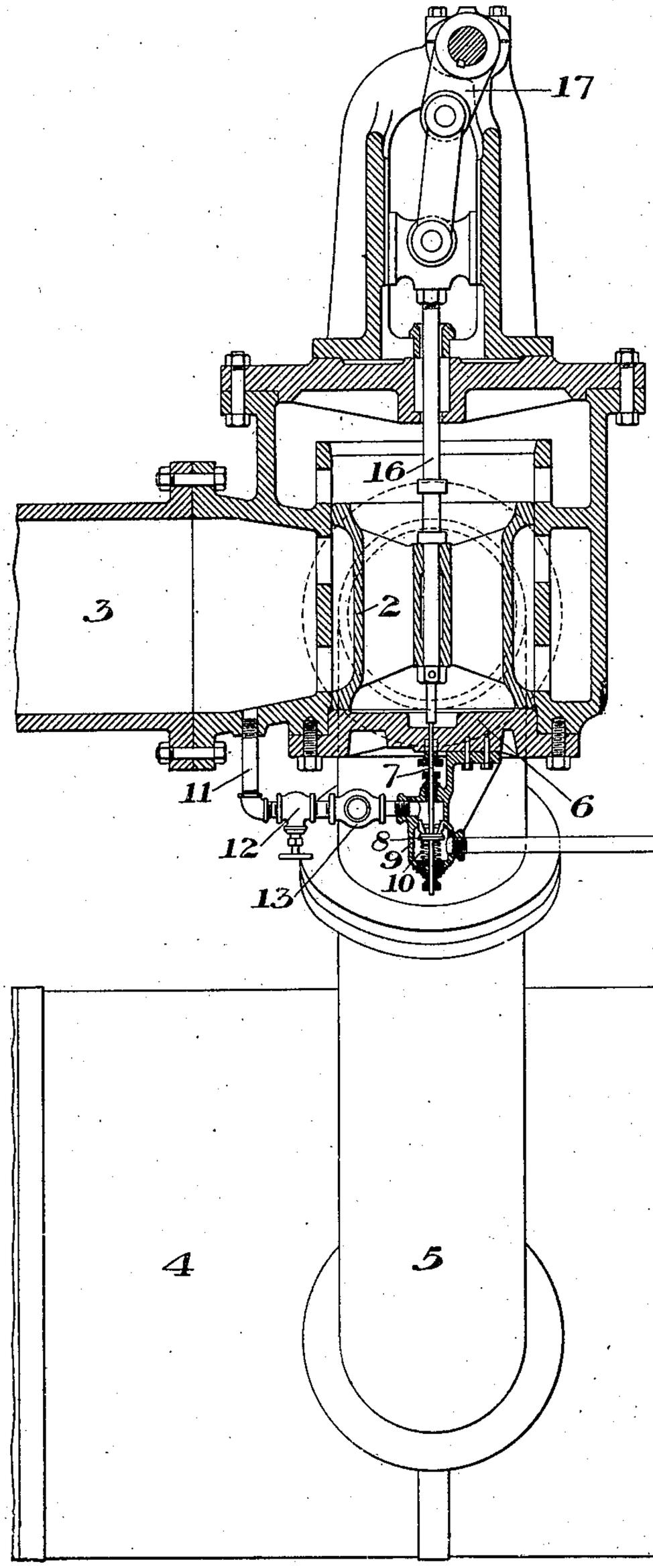
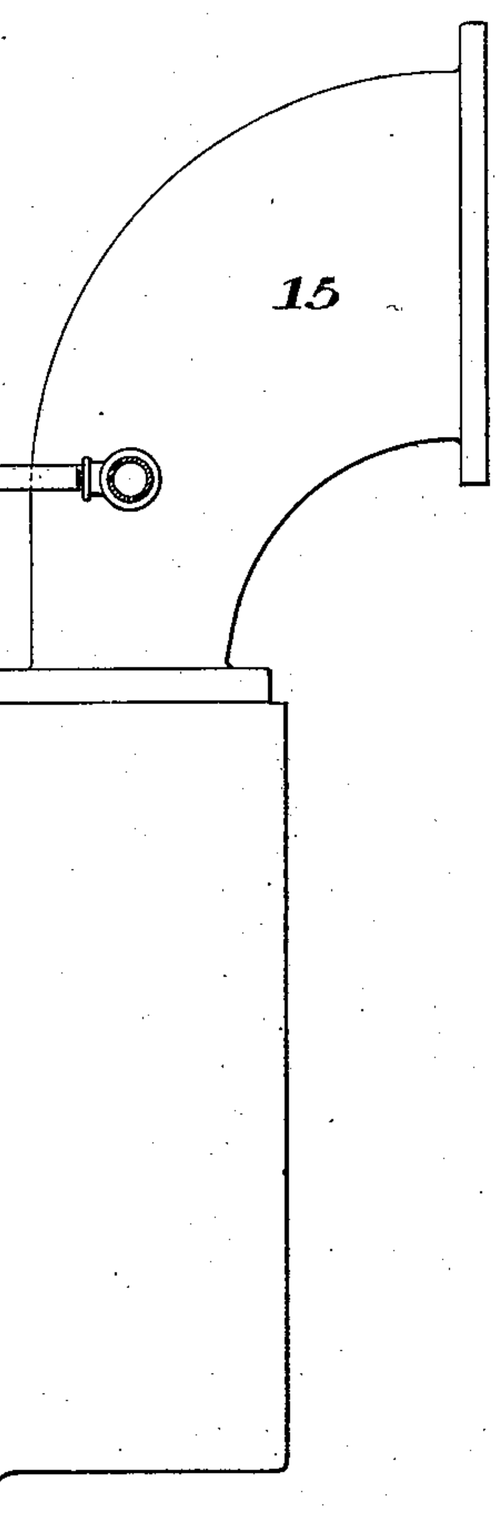


Fig. 1.



WITNESSES

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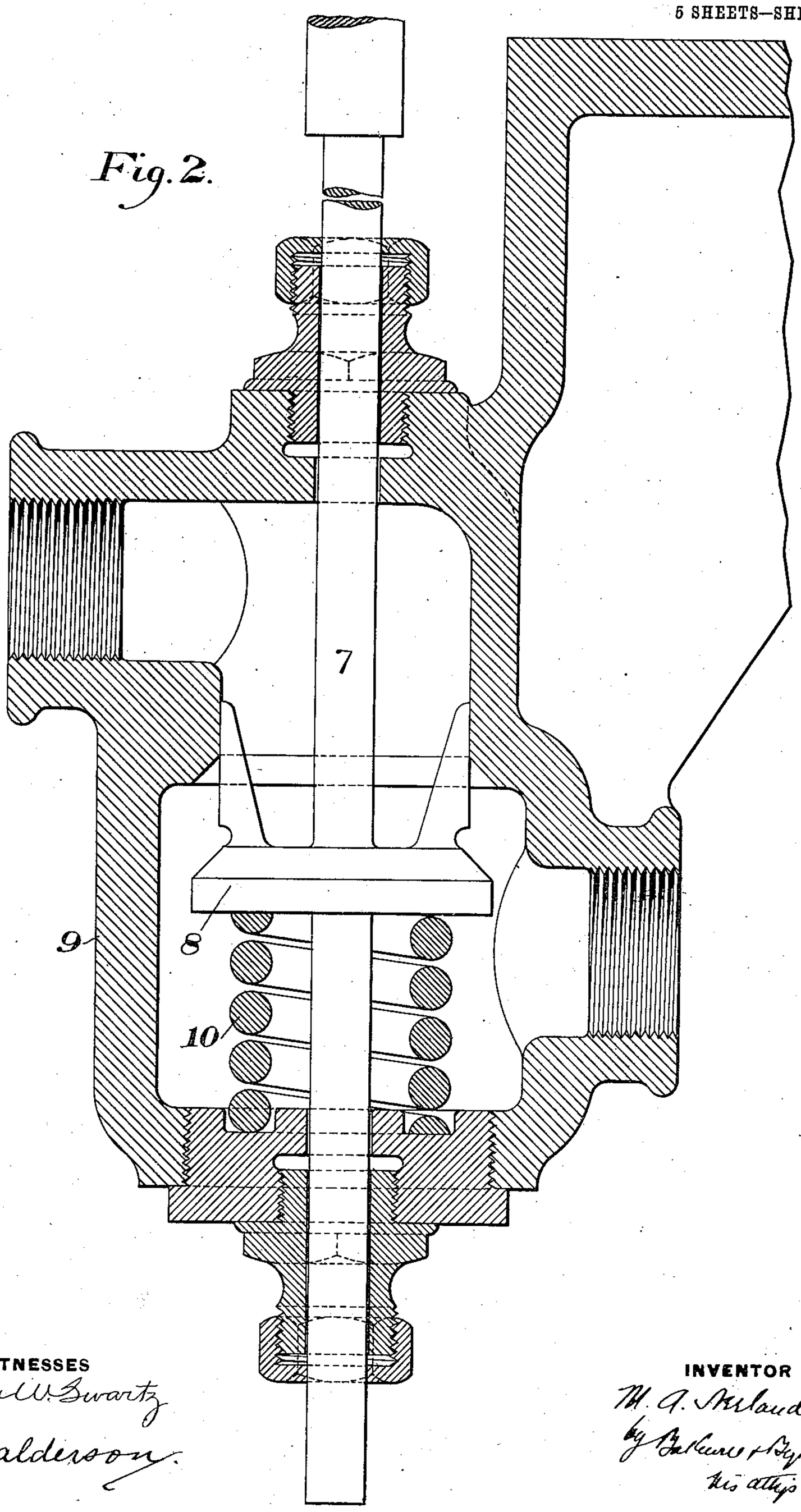
5 SHEETS—SHEET 2.

Fig. 2.



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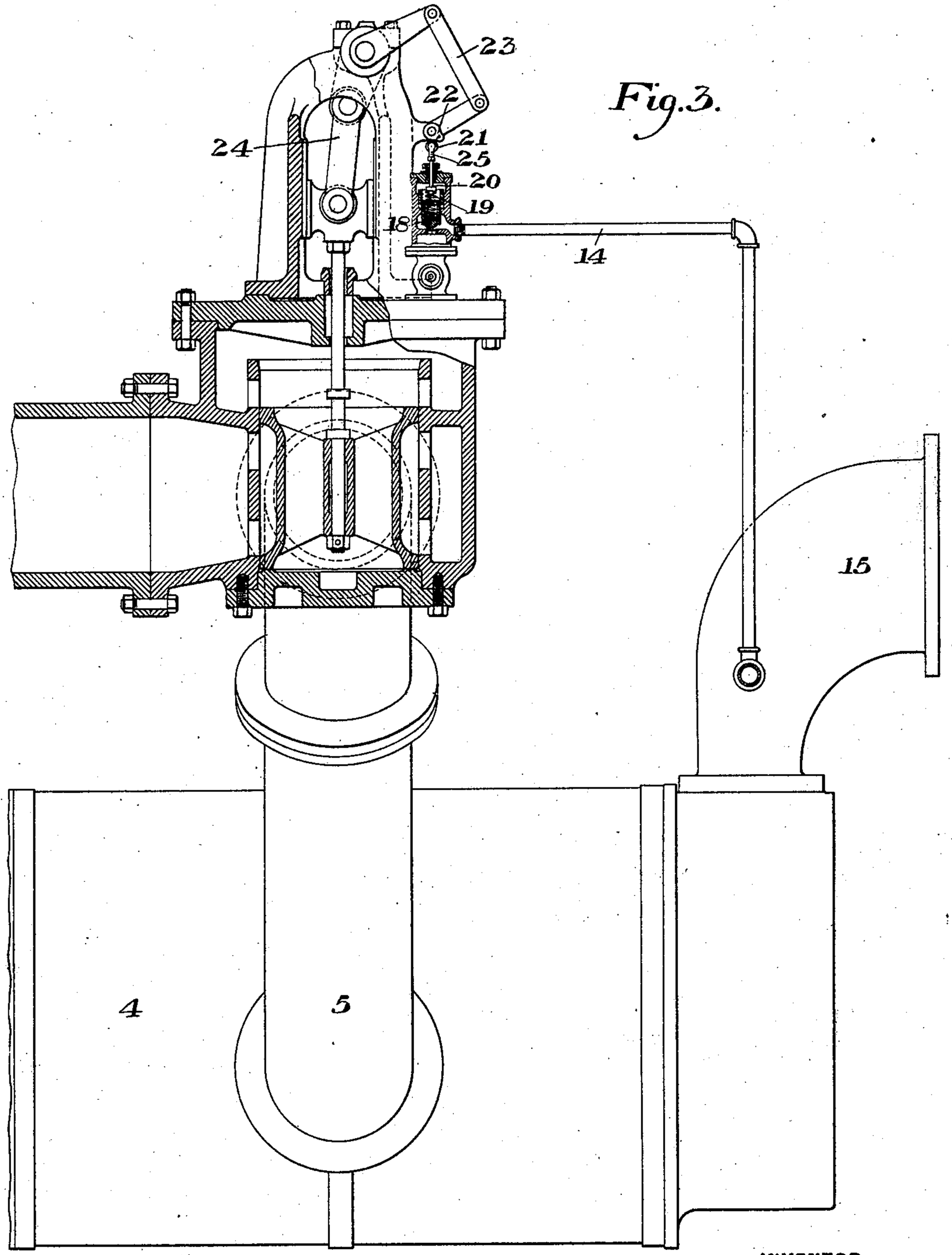
5 SHEETS—SHEET 3.

Fig. 3.



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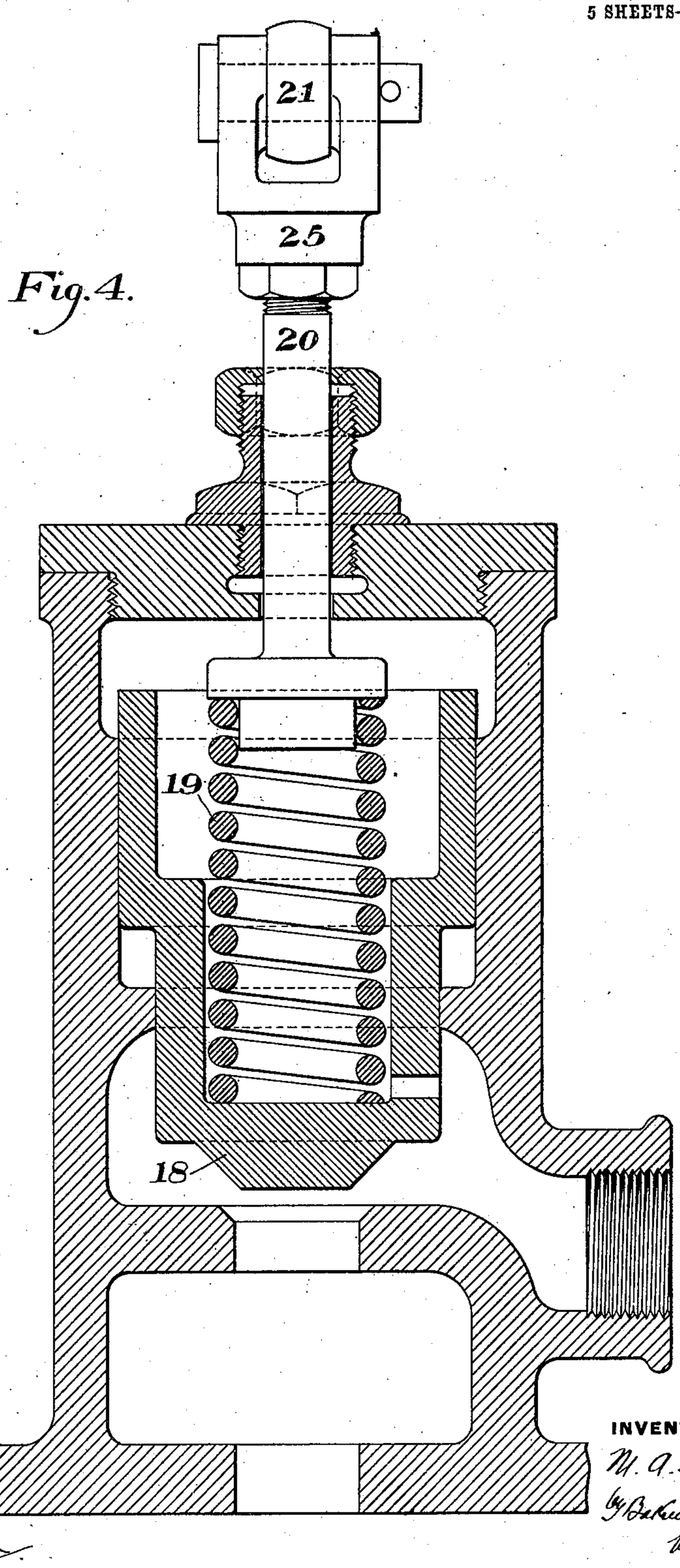
5 SHEETS—SHEET 4.

Fig. 4.



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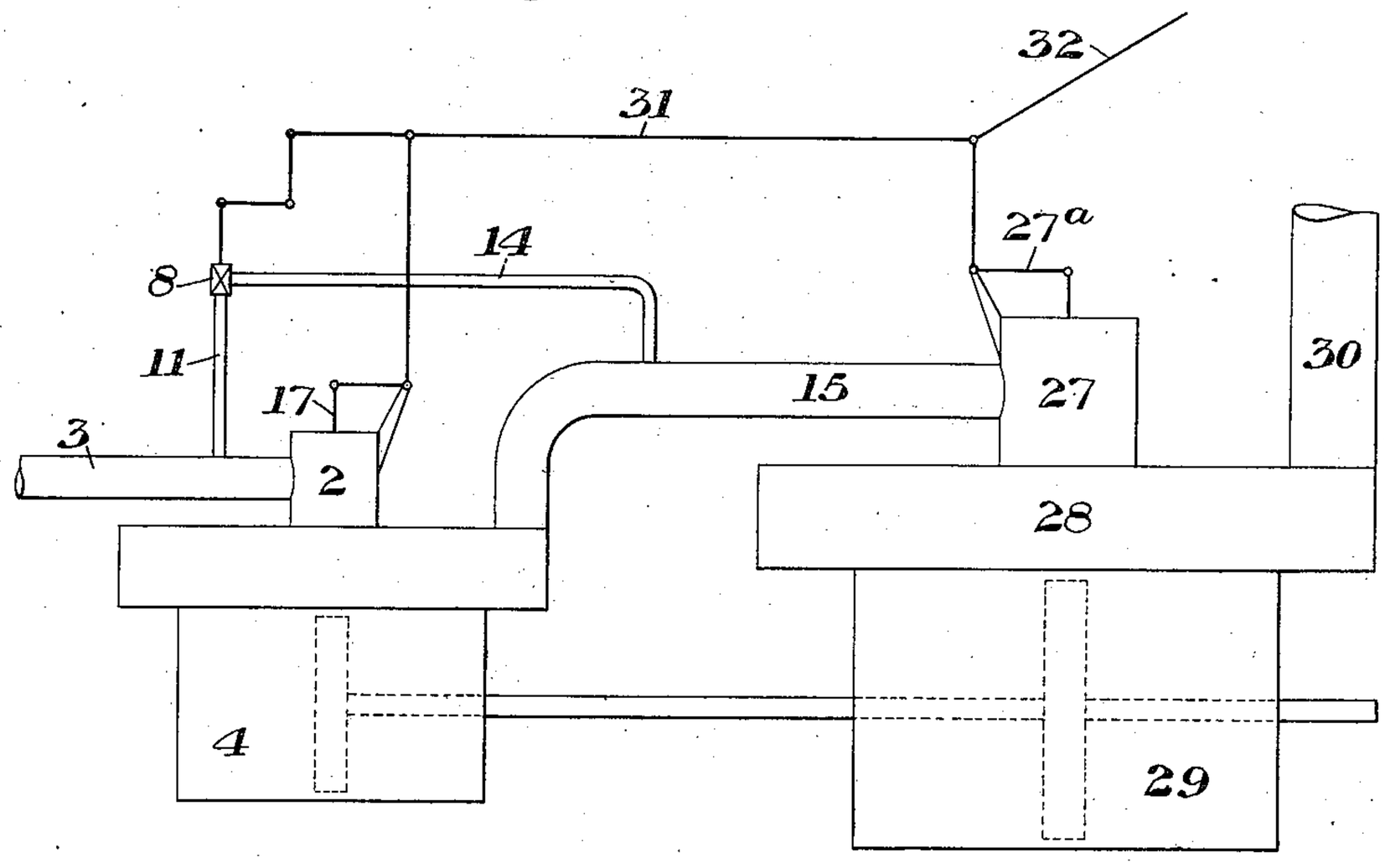
5 SHEETS—SHEET 5.

Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

MARVIN A. NEELAND, OF MONTCLAIR, NEW JERSEY.

COMPOUND ENGINE.

No. 844,388. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed April 21, 1906. Serial No. 312,992.

To all whom it may concern:

Be it known that I, MARVIN A. NEELAND, of Montclair, Essex county, New Jersey, have invented a new and useful Valve Mechanism for Compound Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing one form of my invention. Fig. 2 is an enlarged detail view of the auxiliary valve; and Figs. 3 and 4 are views similar to Figs. 1 and 2, showing another form of the invention. Fig. 5 is a diagrammatic view showing the high and low pressure cylinders, their connections, the main valves therefor, and the valve-actuating mechanism.

My invention relates to compound engines, particularly reversing compound engines, such as are used for driving rolling-mills. In such engines the full starting power which is necessary for quick rolling requires a high receiver-pressure. Such pressure can be maintained only by some shutting-off device between the high and low pressure cylinders. With an ordinary shutting-off device, however, only a moderate receiver-pressure can be maintained by the use of the throttle-valves, and this moderate pressure cannot be maintained on account of loss of pressure through condensation. I have overcome these difficulites by providing a combination of valves which automatically maintains and builds up the receiver-pressure as soon as the throttle-valve or throttle device of the cylinders is closed. This result is preferably accomplished by providing an auxiliary steam-admission valve, which controls the flow of steam from the main steam-pipe into the receiver. This auxiliary valve is arranged so that it is always open when the main throttle is closed and is closed when the main throttle-valve is opened. In connection with this auxiliary valve I also preferably provide a reducing-valve, which is set so that the receiver-pressure will never exceed a predetermined amount—for example, forty pounds to the square inch.

Referring to the form of Figs. 1 and 2, 2 represents the main throttle-valve in closed position, shutting off the main steam-line 3 from the high-pressure cylinder 4. The pipe 5 leads from the side of the main throttle-valve to the high-pressure cylinder, and through the lower head 6 of the valve-casing extends the stem 7 of the auxiliary valve 8, placed within the valve-casing 9. This valve 8 is shown as seating upwardly and normally closed by a spring 10. The steam is admitted to the upper part of the auxiliary-valve casing through the branch pipe 11, having the hand globe-valve 12 and the reducing-valve 13. From below the valve 8 the pipe 14 leads to the receiver connection 15. The stem 16 of the main throttle-valve is in line with the valve-stem 7 and is arranged to push the auxiliary valve downwardly and open it as the main throttle-valve is closed. The mechanism for closing the main throttle-valve is indicated at 17 and may be of any desirable type.

In Fig. 5 I have illustrated diagrammatically high and low pressure cylinders, their valve mechanism, and connections. In this figure, 28 designates the steam-chest of the low-pressure cylinder 29. 27 is the main throttle-valve of the low-pressure cylinder. 27ª designates the valve-actuating mechanism which is connected by a link 31 with the valve-actuating mechanism 17 of the throttle-valve 2 of the high-pressure cylinder 4. 30 designates the exhaust connection from the low-pressure cylinder, and 32 is an operating connection for the valve-operating means.

In the use of the device as soon as the main throttle is closed the auxiliary valve is thereby opened and steam flows from the main steam-line through the reducing-valve to build up the pressure in the receiver to the predetermined amount. As soon as the high and low pressure throttles are opened the valve 8 will be seated by its spring, and thus shut off the auxiliary supply. I thus obtain the full power of the engine in starting, while at the same time providing for two-stage expansion for all steam flowing into the engine after it has started. I also obtain maximum economy. The auxiliary valve may of course be operated either from the high-pressure throttle-valve, as shown, or from the low-pressure throttle-valve, or from both. The invention may also be carried out by combining the auxiliary admission-valve and the reducing-valve in one structure. Thus in Figs. 3 and 4 I show the combined auxiliary and reducing valve 18, which is normally forced down to its seat by a spring 19. The spring is strong enough so

that it reduces from boiler-pressure to vacuum. Ordinarily this valve will stay shut; but the upper end of the spring bears against an annular shoulder on the stem 20, which bears upon this upper end and adjustably carries the roller 21, acted upon by cam 22, connected by link mechanism 23 with the throttle-actuating mechanism 24. The roller 21 is carried in an adjustable mounting 25, which is screwed on the stem 20 so that it may be adjusted to different positions. The arrangement is such that the spring is compressed when the throttle-valve is opened and is released when the throttle-valve is closed to edge position. By adjusting the roller-carrier on the thread the tension of the spring can be so adjusted that at this position—that is, when the main throttle-valve is edge to edge—the boiler-pressure just balances the closing-spring, so that steam can flow from the live-steam main into the receiver. This steam also flows through a hole 26 in the hollow valve into the space above the valve, thus shutting the valve as soon as the receiver-pressure has risen to the desired amount.

The advantages of the invention will be apparent to those skilled in the art, since it enables a compound engine to be used, while automatically giving high receiver-pressure for quick starting. I thus obtain the full power of the engine in starting, while at the same time obtaining the economy resulting from two-stage expansion.

Many changes may be made in the form and arrangement of the auxiliary supply-valve and the means for operating the same without departing from the invention.

I claim—

1. A compound engine having a throttle-control valve, a receiver, an auxiliary admission-valve between the live-steam pipe and the receiver, and connections arranged to close the auxiliary valve when the control-valve is opened and vice versa; substantially as described.

2. A compound engine having a throttle-control valve, a receiver, a shutting-off device between the receiver and low-pressure cylinder or cylinders, an auxiliary admission-valve between the live-steam pipe and the receiver, and connections arranged to close the auxiliary valve when the control-valve is opened and vice versa; substantially as described.

3. A compound engine having an auxiliary steam-admission valve between the live-steam pipe and receiver-pipe, a shutting-off device between the receiver and the low-pressure cylinder, and connections for opening the auxiliary valve simultaneously with the closing of the shutting-off device; substantially as described.

4. In a compound engine, a live-steam connection between the steam-main and the receiver-pipe, a reducing-valve in said pipe, a steam-admission valve located in said pipe, and connections to the throttle-valve mechanism arranged to operate said valve; substantially as described.

In testimony whereof I have hereunto set my hand April 18, 1906.

MARVIN A. NEELAND.

Witnesses:

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GEORGE H. SONNEBORN.