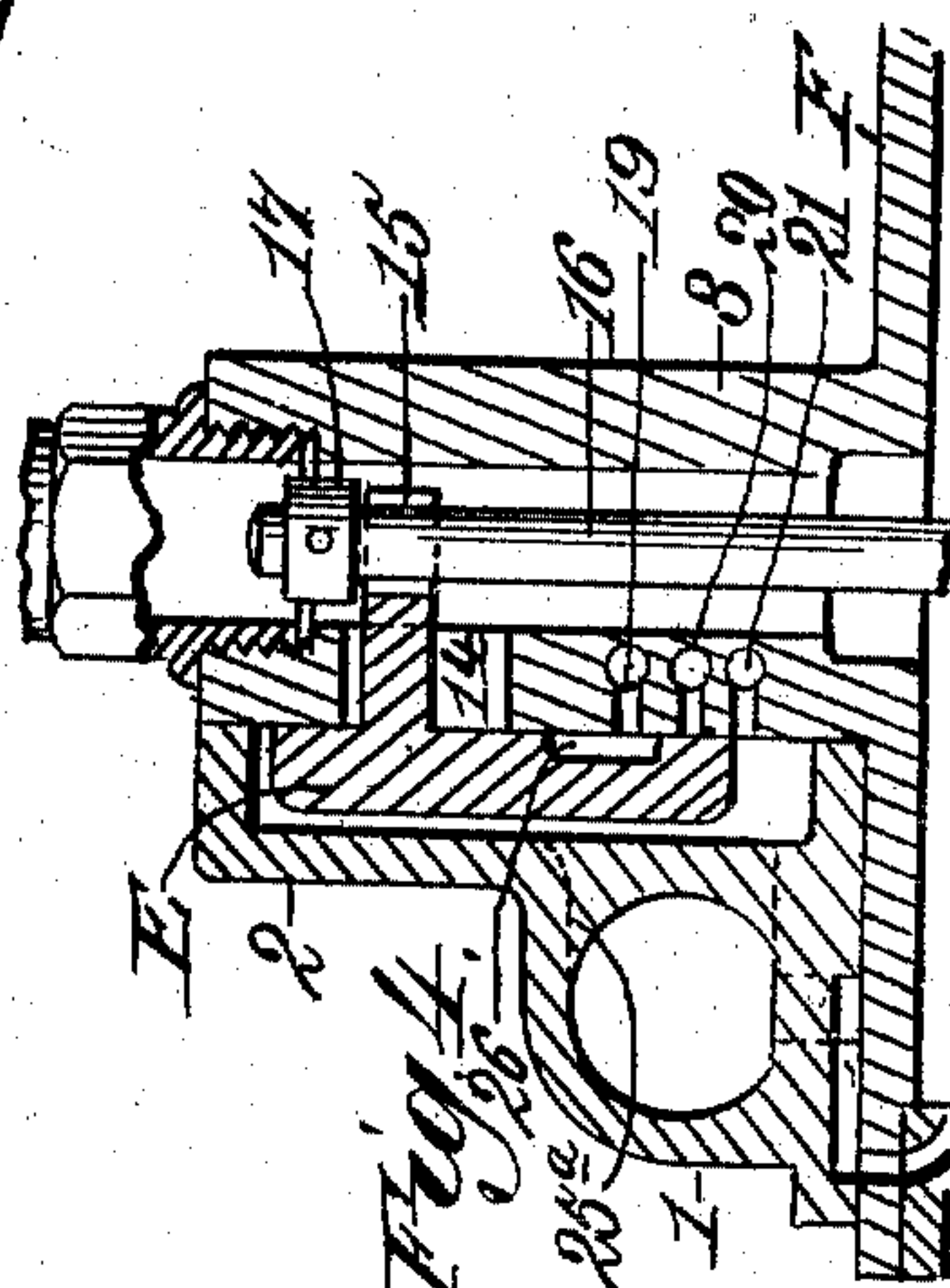
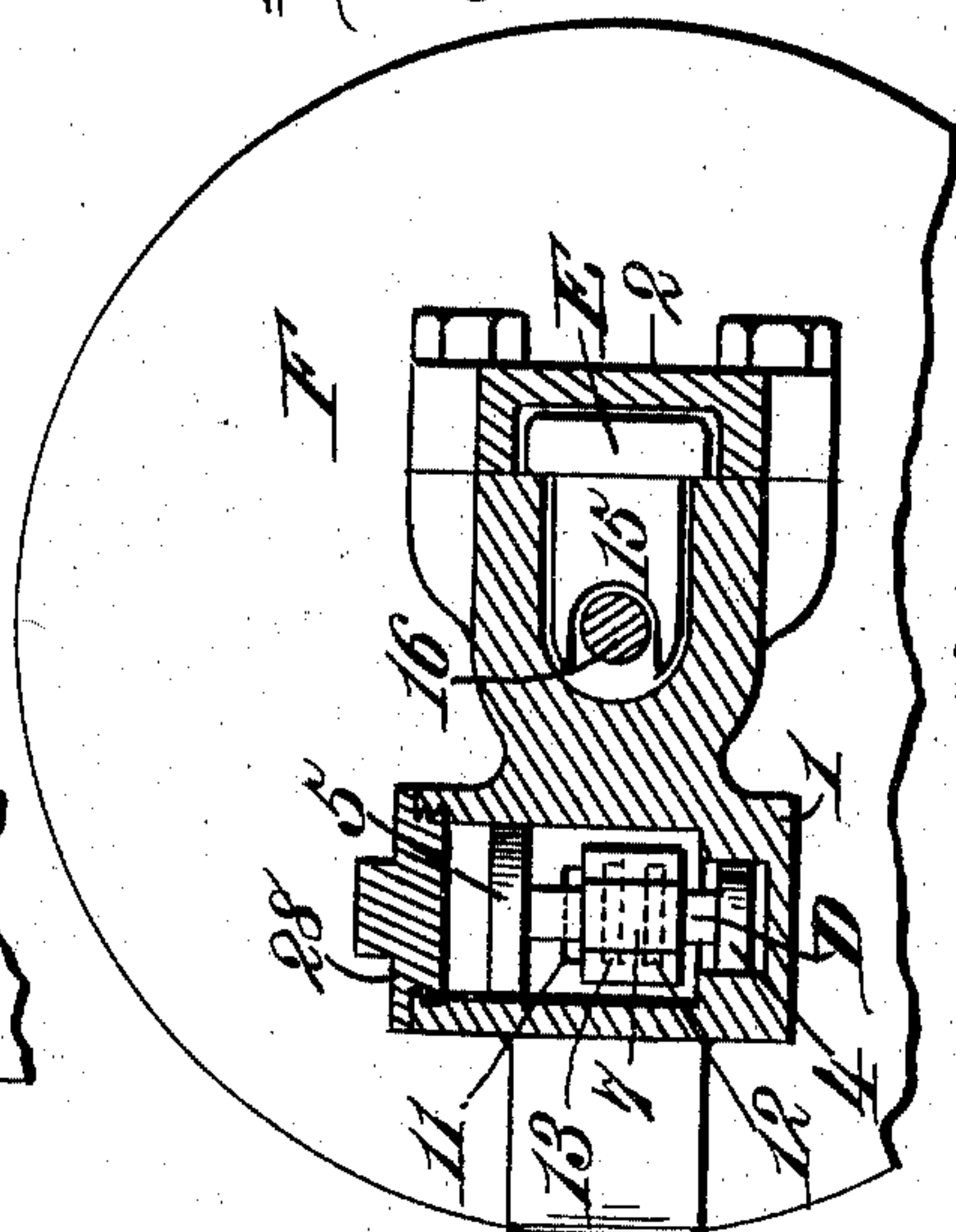
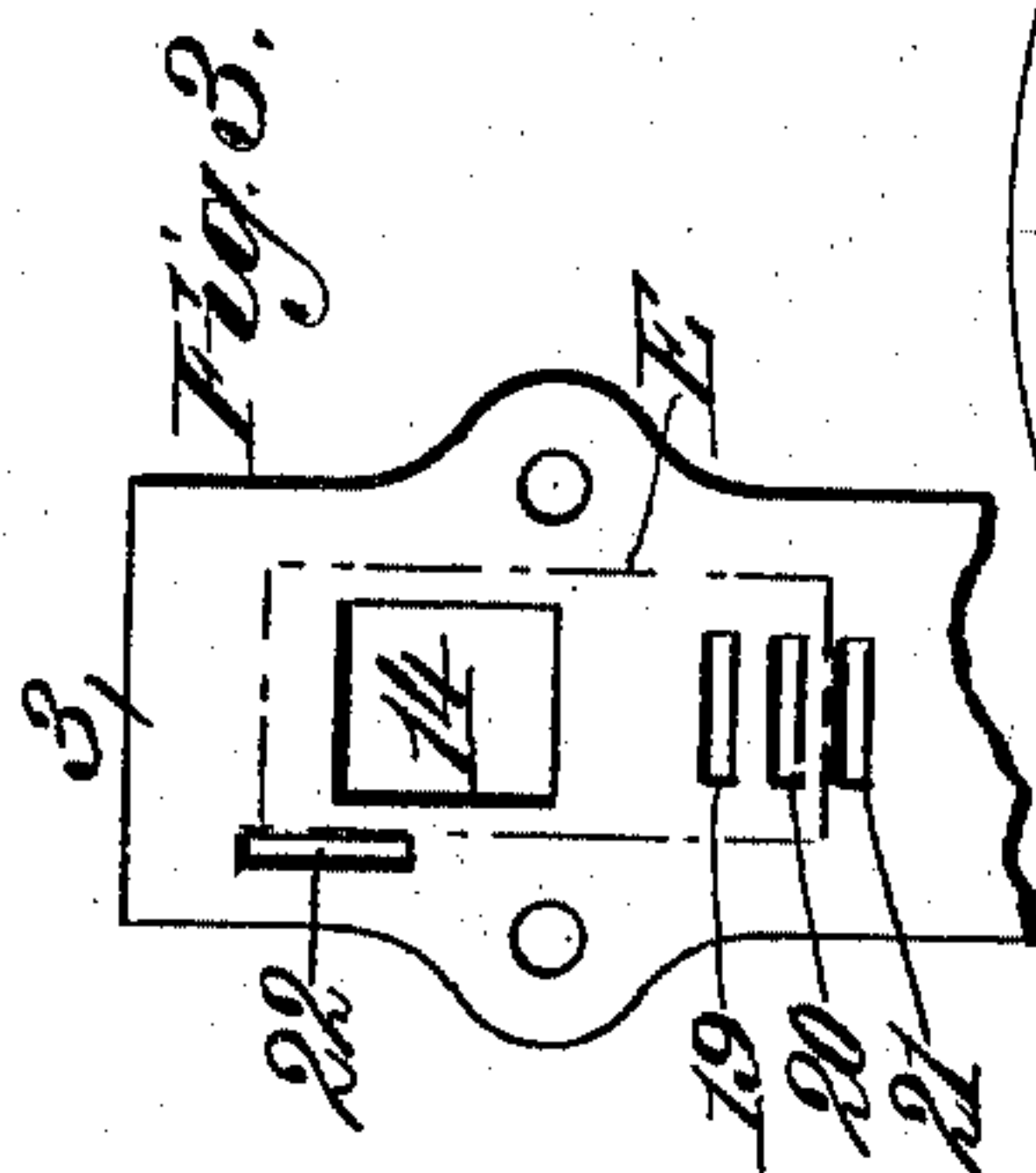
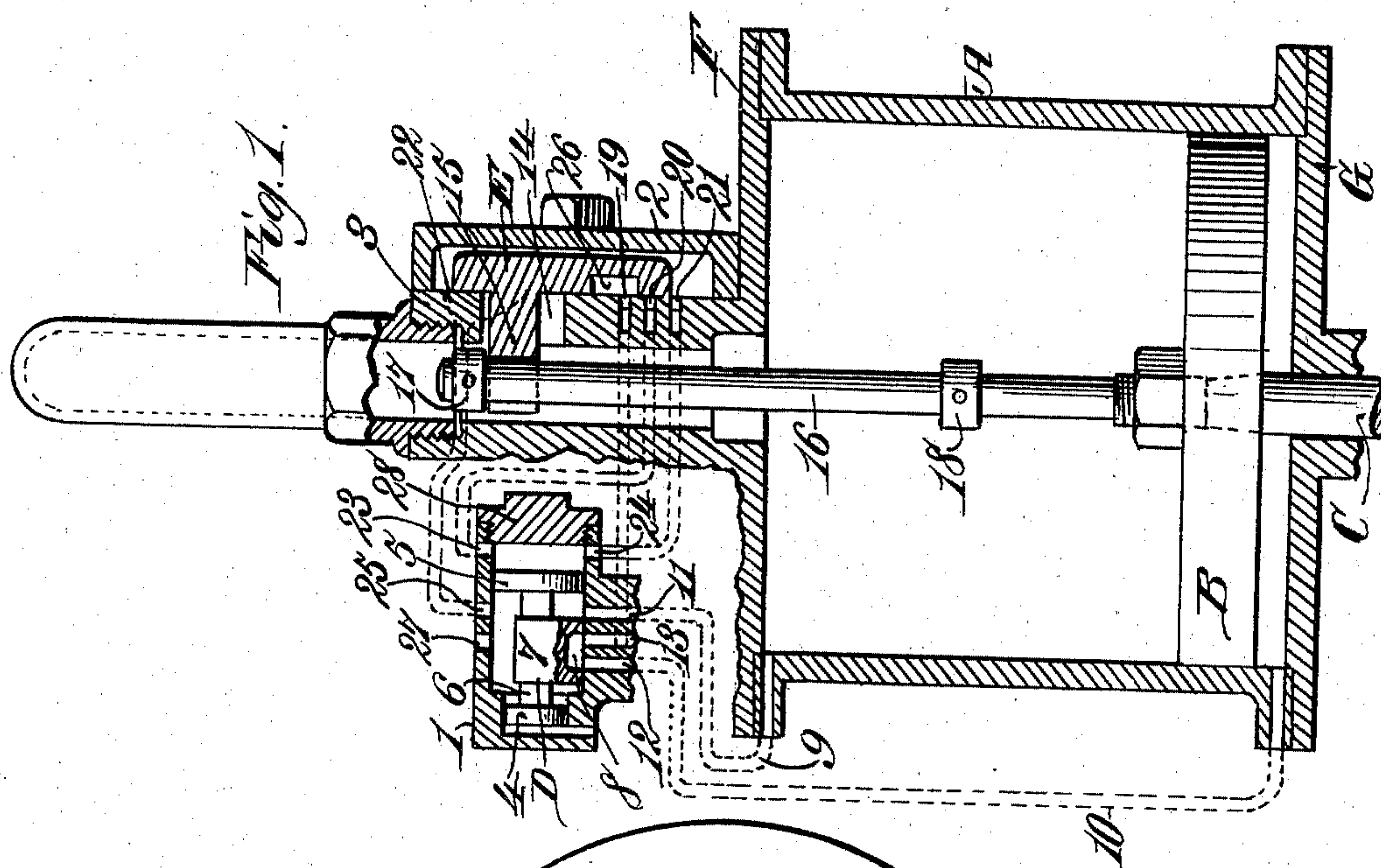


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VALVE ARRANGEMENT FOR STEAM ENGINES.  
APPLICATION FILED SEPT. 7, 1909.

966,880.

Patented Aug. 9, 1910.



Witnesses,  
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*Fig. 2.*

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By James L. Norris  
Att'y.



# UNITED STATES PATENT OFFICE.

THOMAS G. AULTMAN, OF FAIRMONT, WEST VIRGINIA.

VALVE ARRANGEMENT FOR STEAM-ENGINES.

966,880.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed September 7, 1909. Serial No. 516,388.

*To all whom it may concern:*

Be it known that I, THOMAS G. AULTMAN, a citizen of the United States, residing at Fairmont, in the county of Marion and State of West Virginia, have invented new and useful Improvements in Valve Arrangements for Steam-Engines, of which the following is a specification.

This invention relates to new and useful improvements in the valve arrangements of steam pumping engines, and more particularly to that type of construction in which the main distribution valve is controlled by an auxiliary or reversing valve operated by the movement of the main steam piston of the engine through the agency of a connecting member which has a movement coincident with that of the main steam piston.

The object of the invention is the provision of a valve arrangement in which the parts are so constructed and combined that the usual joint packings to prevent the escape of steam from the reversing valve casing to the extension of the cylinder or to the cylinder are not necessary and in which the usual hollow piston rod and reversing plate for producing a mechanical throw of the reversing valve are eliminated and their functions are carried out by novel parts of less expensive construction and which are less liable to become out of order and are more readily replaced and repaired.

A preferred and advantageous embodiment of the invention is illustrated, by way of example, in the accompanying drawings, wherein:

Figure 1 is a diagrammatic longitudinal sectional view showing a valve arrangement in accordance with the present invention. Fig. 2 is a central horizontal sectional view of a construction in which the novel valve arrangement is preserved. Fig. 3 is a plan view of the ported plate with relation to which the reversing valve has movement. Fig. 4 is a sectional view illustrating an alternative arrangement in which the reversing and main valve casings are arranged to form one chamber.

Similar characters of reference designate corresponding parts throughout the several views.

The steam cylinder is shown at A, the main steam piston at B, its rod at C, the main distribution valve at D and the reversing valve at E.

The valve D is mounted in a casing 1 and the valve E is mounted in a casing 2. The cylinder A has the upper and lower heads F and G and the former has an axial tubular extension, as 3, which communicates with the cylinder A and, in the example shown, forms one wall of the casing 2.

The main distribution valve D may be advantageously of the differential piston type, and accordingly has two heads, 4 and 5, the latter being larger than the former. The heads 4 and 5 are, as usual, connected by a rod, as 6, upon which is mounted the slide valve 7, having the cavity 8.

Steam is admitted into and exhausted from the upper and lower ends of the cylinder through the respective passages 9 and 10, (shown in dotted lines), which communicate with ports 11 and 12, respectively, in the casing 1. The ports 11 and 12 are alternately put into and out of communication with the steam space in the casing 1 and also with a main exhaust port, as 13, which is likewise formed in the casing 1.

The auxiliary or reversing valve E is in the form of a slide plate and always covers an opening, as 14, which is formed in the extension 3. The valve E is provided with a lug, as 15, which projects through the opening 14, into the bore of the extension 3. The piston B is employed as a prime mover to produce a mechanical throw of the valve E and an advantageously operative connection between said piston and said valve embodies a stem, as 16, which is carried by the piston and forms an axial extension of the rod C. The stem 16 is provided with upper and lower collars, as 17 and 18, which alternately strike the lug 15 and thereby produce opposite movements of the valve E. The end of the lug 15 may, for convenience, be bifurcated to straddle the stem 16.

The arrangement of ports connecting the casings 1 and 2 is well known and will only be referred to briefly. The portion of the extension 3 which forms the wall of the casing is provided in its lower portion with ports 19, 20 and 21 and in its upper portion with a port 22. The ports 19, 20, 21 and 22 have communication, as indicated by dotted lines, with ports in the casing 1, which are respectively designated 13, 23, 24 and 25. The valve E has a cavity 26 which alternately establishes and disestablishes the communication of the ports 19 and 20.



The operation is as follows: Steam is at all times admitted to the casing 1 through a port 27 and from the casing 1 to the casing 2 through the ports 25 and 22, the latter being at one side of the valve E, as shown in Fig. 3, and being always uncovered. By virtue of this relation, the casings 1 and 2 may, if desired, be arranged to form one chamber, as shown in Fig. 4, wherein the casings 1 and 2 communicate through an opening, as 25<sup>a</sup>, and the port 22 is eliminated. With the parts in the position shown, steam passes through the ports 11 and 9 into the upper end of the cylinder A, driving the piston B downwardly. At the same time the steam in the lower end of the piston is exhausting through the passage 10, port 12, cavity 8 and port 13. As the piston B completes its downward stroke, the collar 17 engages the lug 15 and produces a corresponding downward movement of the valve E, by virtue of which the ports 19 and 20 are put into communication, and the port 21 covered. The steam pressure in the space between the piston 5 and the head 28 of the casing 1 is now relieved, the steam exhausting through the ports 23 and 20, cavity 26, and ports 19 and 13. The pressure being thus relieved from the outer face of the head 5, the pressure between the heads 4 and 5 will produce a movement of the valve D to the right when the drawings only are considered. When the valve D is moved to the right the communication of the port 11 with the steam space in the casing 1 is disestablished and its communication with the port 13 is established, while, at the same time the communication of the port 12 with the port 13 is disestablished and its communication with the steam space of the casing is established. Steam is thus admitted into the lower end of the cylinder A and exhausted from the upper end thereof. Consequently, the piston B moves on its upward stroke and as it completes its upward stroke the collar 18 engages the lug 15 to produce an upward movement of the valve E to the position shown in Fig. 1 of the drawing wherein the port 21 is uncovered and the communication of the ports 19 and 20 disestablished. Steam now flows through ports 21 and 24 into the casing 1 between the head 5 of the valve D and the head 28 of the casing 1, so that by reason of the fact that the area of the head 5 of the valve D on the side toward the head 28 is greater than that on the opposite side, the valve D is moved to the left to the position shown in Fig. 1 of the drawing at which time steam is permitted to flow through the port 11 to the upper end of the cylinder A and the port 12 is thrown into communication with the exhaust port

13 so that the piston B is moved downwardly as previously described.

For the sake of convenience, the closed upper end portion of the extension 3 may be made as a removable section 28, which is threaded into the body of the extension.

It will be noted that the valve E has a flat bearing surface and may be operated without any packed joints. Furthermore, since said valve at all times covers the opening 14, the escape of steam from the casing 2 into the extension 3 is prevented. It is, therefore, unnecessary to provide stuffing boxes, glands, or other forms of packed joints for the stem 16 or lug 15.

The stem 16, with its collars 17 and 18, constitutes an efficient means for producing the movements of the valve E and is less expensive than either the hollow rod and reversing plate or other known forms of mechanical throw connections. It possesses a further advantage in that it is not liable to become out of order and the valve will therefore not be subject to extraneous conditions which might impair its efficiency of operation.

The assemblage of parts is also of merit since it preserves the known advantage of providing for access to the various parts for the purposes of cleaning, renewal or repairs, without the necessity of removing the upper cylinder head.

Having fully described my invention, I claim:

The combination with a steam cylinder and its piston, the cylinder having one of its heads provided with an axial hollow extension which communicates with the cylinder and has an opening at one side thereof, a slide valve movable across the opening, at all times closing the same, having a steam-tight fit against its seat, and having a lug which projects through the opening and into the extension, a stem carried rigidly by the piston and projecting axially therefrom into the extension, upper and lower collars provided on the stem to alternately engage the lug and correspondingly move the valve as the piston approaches the limits of its movements, and a main distributing valve which controls the admission and exhaust of steam to and from the opposite ends of the cylinder and is in turn controlled by the slide valve.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS G. AULTMAN.

Witnesses:

GADDIS AULTMAN,  
JOHN AULTMAN.