(No Model.) 5 Sheets—Sheet 1.

A. R. BOLUSS.

STEAM ACTUATED VALVE.

No. 491,506. Patented Feb. 7, 1893.

Fig. 1.

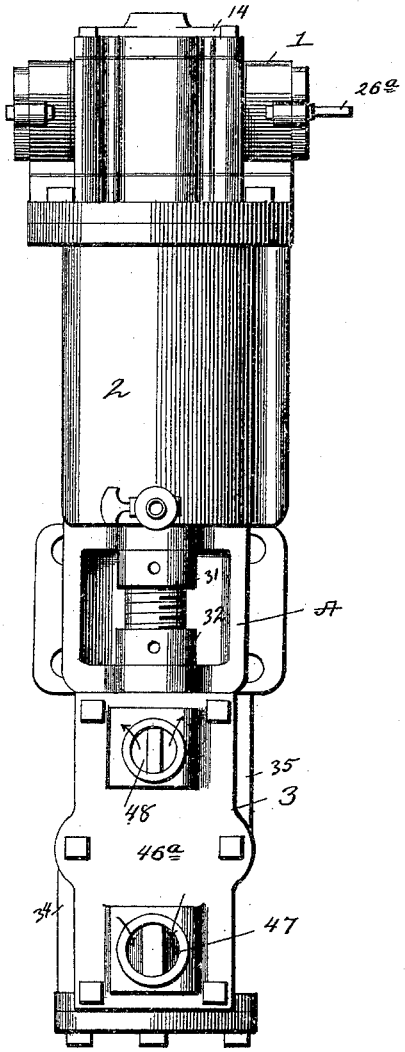
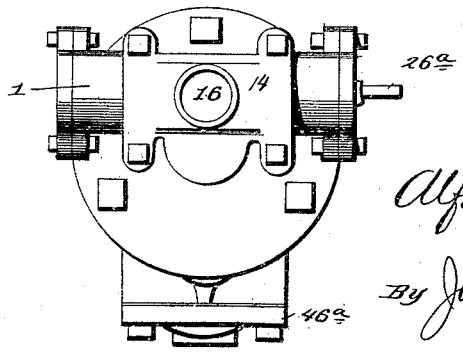


Fig. 2.



Witnesses:
C. H. Raeder
M. F. Matthews.

Inventor
Alfred R. Boluss
By James J. Sheehy
Attorney

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A. R. BOLUSS.

STEAM ACTUATED VALVE.

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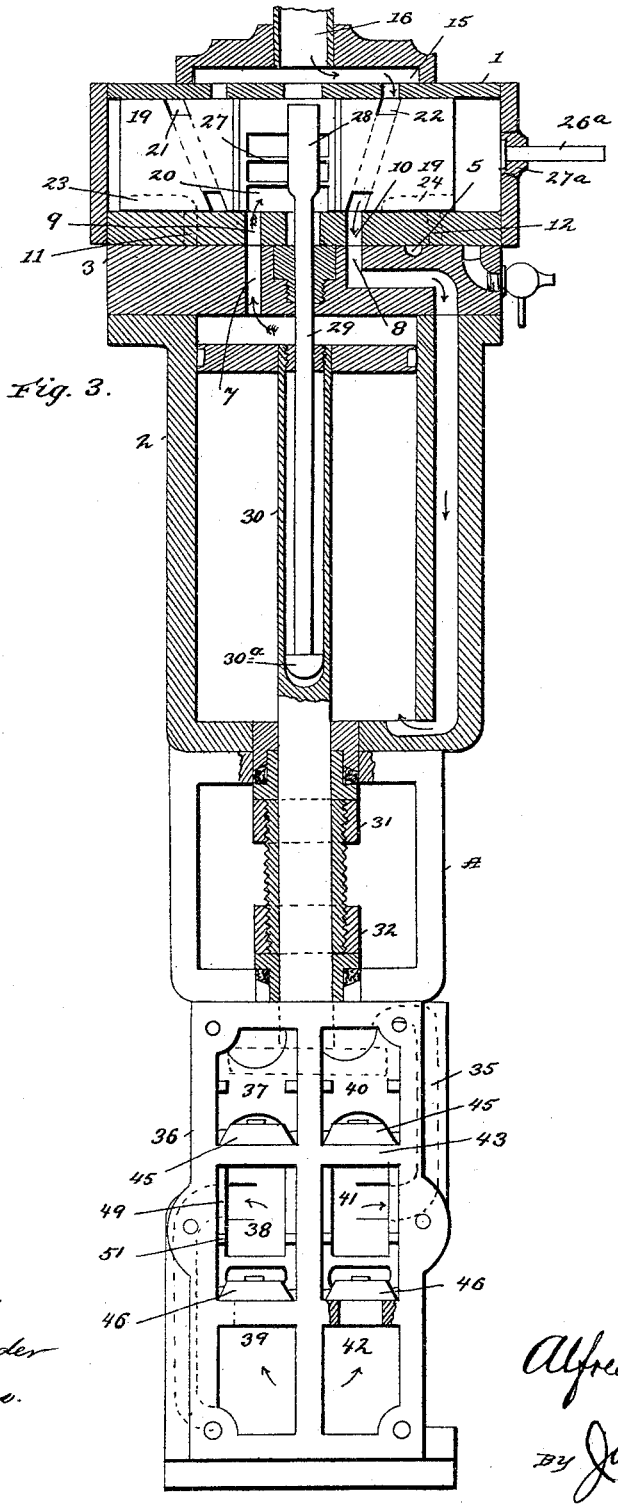

Fig. 3.

Witnesses:
C. H. Raeder
W. G. Matthews.

Inventor
Alfred R. Boluss
By James J. Sheehy
Attorney

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A. R. BOLUSS.

STEAM ACTUATED VALVE.

No. 491,506. Patented Feb. 7, 1893.

Fig. 4.

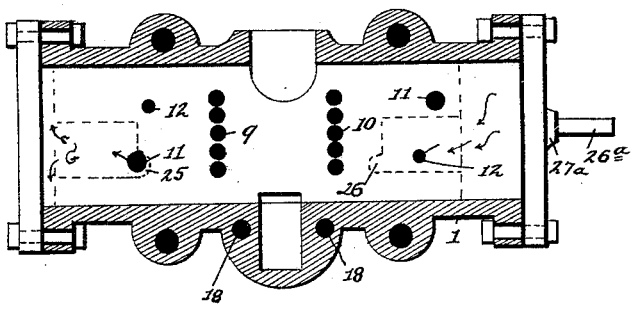


Fig. 5.

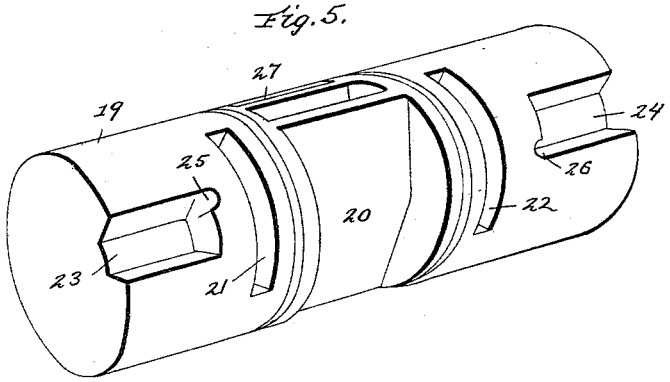
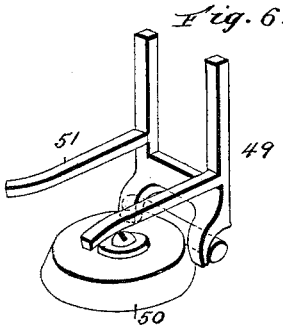


Fig. 6.



Witnesses:
C. H. Raeder
W. G. Matthews.

Inventor
Alfred R. Boluss.
By James J. Sheehy
Attorney

(No Model.) 5 Sheets—Sheet 4.

A. R. BOLUSS.

STEAM ACTUATED VALVE.

No. 491,506. Patented Feb. 7, 1893.

Fig. 7.

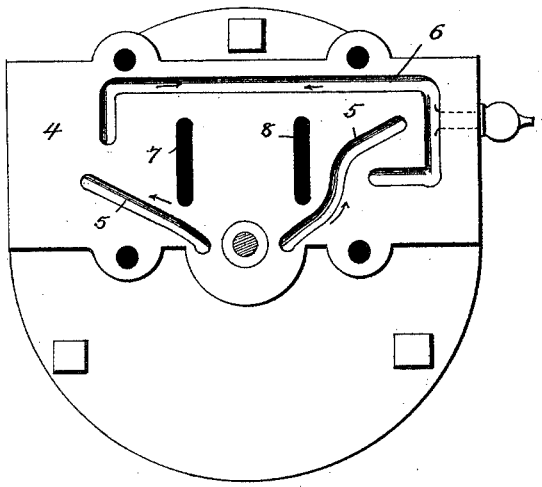


Fig. 8.

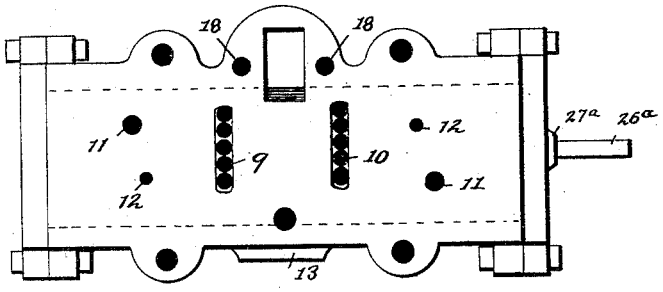
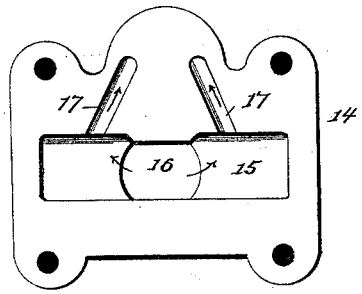


Fig. 9.



Witnesses:
C. F. Kaeder
M. G. Matthews.

Inventor
Alfred R. Boluss
By James J. Shechy
Attorney

(No Model.) 5 Sheets—Sheet 5.

A. R. BOLUSS.

STEAM ACTUATED VALVE.

No. 491,506. Patented Feb. 7, 1893.

Fig. 10.

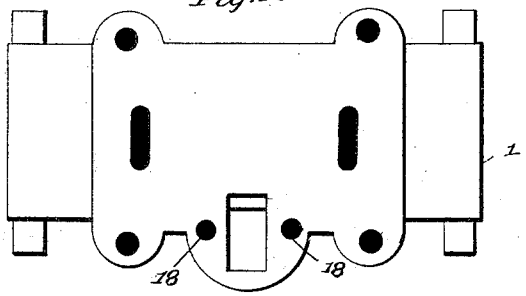


Fig. 11.

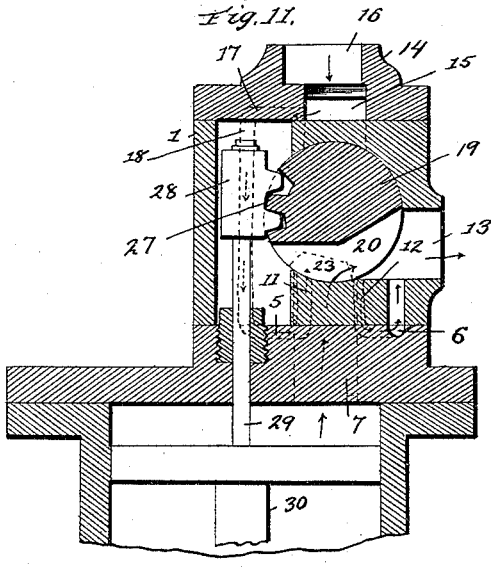
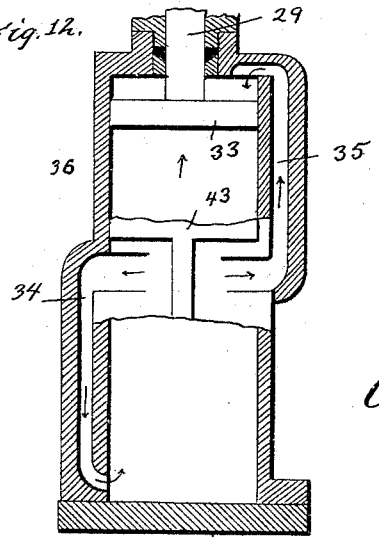


Fig. 12.



Witnesses:
C. H. Kaeder
W. F. Matthews.

Inventor
Alfred R. Boluss
By James J. Shelby
Attorney

UNITED STATES PATENT OFFICE.

ALFRED R. BOLUSS, OF NORWOOD, OHIO, ASSIGNOR OF ONE-HALF TO WILLIAM T. BOTHWELL, OF JERSEY CITY, NEW JERSEY.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 491,506, dated February 7, 1893.

Application filed May 25, 1892. Serial No. 434,357. (No model.)

To all whom it may concern:

Be it known that I, ALFRED R. BOLUSS, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Steam-Actuated Valves; 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.

This invention relates generally to a combined oscillating and reciprocating valve for steam engines, and improvements in the construction of the valve casing to serve in conjunction with said valve, and the invention is designed as improvements upon the device shown and described in the Letters Patent granted to me December 23, 1890, No. 443,233.

In illustrating my invention I have shown and described the same in connection with another invention in pumps as in many cases the two are combined and used together but it is obvious that the valve and its mechanism may be used for other purposes or with other forms of pump, and I have therefore filed another application of even date herewith, in which I have set forth and claimed the pump which I have shown in the present case.

One of the objects of my invention is to provide for cushioning the valve of the engine by which the pump piston is driven during the major portion of the longitudinal travel of the said valve, and permitting the steam to gradually escape near the termination of each stroke of the piston, so as to prevent the valve from hammering against the ends of the valve chest at the termination of its respective strokes as more fully hereinafter specified, and another object of the invention is to so construct the valve which will have a rocking reciprocating motion and adapt the valve box and various ports to serve in conjunction therewith so as to increase the efficiency of the valve and render the same capable of operation with a comparatively small amount of steam.

Other objects and advantages will appear from the following description and claims when taken in connection with the annexed drawings in which:

Figure 1, represents a front elevation of my improved steam engine and pump. Fig. 2, is a top view thereof. Fig. 3, is a vertical sectional view of the engine and pump, showing my improved valve. Fig. 4, represents a longitudinal vertical sectional view of the valve chest showing the valve and the cushioning steam ports in dotted lines. Fig. 5, represents a perspective view of the valve. Fig. 6, represents a perspective view of one of the pump valves and the frame for holding the same to its seat. Fig. 7, represents a plan view of the seat upon which the valve chest is fastened, showing the cylinder ports, and the inlet and outlet passages, by which steam is admitted to the valve chest at each end of the valve, and exhausted therefrom. Fig. 8, represents a plan view of the bottom of the valve chest showing the lower openings of the ports therein. Fig. 9, represents a plan view of the bottom of the steam chest showing the passages through which steam is supplied to the cylinder, and the valve chest. Fig. 10, represents a plan view of the seat to which said steam chest is secured, showing the inlet ports in the same. Fig. 11, is a transverse vertical sectional view through the valve chest and valve, and the upper part of the steam cylinder, and: Fig. 12, is a vertical sectional view of the pump cylinder.

Referring to the drawings: the numeral 1, indicates the valve casing; 2, the steam cylinder of the engine, and 3, the pump cylinder; the steam and pump cylinders being preferably cast integral or in one piece with an intervening space indicated by the letter A. The steam cylinder has upon its upper head, a seat 4, for the valve chest or casing and the said seat is provided with grooves or passages 5, (Fig. 7,) which serve in connection with passages or ports through the valve casing, to be hereinafter mentioned, to admit steam from the steam chest to the valve chest or casing. The said seat is also provided with a groove or passages 6, (Fig. 7,) which serve in connection with a suitable port in the valve chest to exhaust the steam from said chest or chamber.

The numerals 7, and 8, indicate ports leading through the head to opposite ends of the steam cylinder, for the alternate induction and eduction of steam to and from the same.

The bottom of the valve chest, shown in Fig. 8, is provided with ports 9, and 10, which register with the ports 7, and 8, just above mentioned. The ports 11, and 12, which are located at opposite sides of a vertical plane, drawn through the valve, are out of line with each other for the purpose hereinafter explained.

The numeral 14, Fig. 9, indicates a flanged plate, having a shallow recess or steam chest 15, in its lower face, and an induction port 16, leading thereto. The said lower face of the plate is also provided with passages 17, which connect with vertical passages 18, (Fig. 10,) in one side wall of the valve chest, the said passages in turn connecting with the inlet passages 5, to admit steam alternately to opposite ends of the valve chest to reciprocate the valves, the admission of the steam being controlled by the valve in its operation, as will be hereinafter explained.

The numeral 19, indicates the cylindrical valve, which is shorter than the bore of the valve chest. The said valve is fitted and adapted to reciprocate within the bore of said valve chest, and midway between its ends is provided with a transverse port or recess 20, which is always in connection with the exhaust port of the valve chest. The valve at each side of the said central port is also provided with inclined ports 21, and 22, for the inlet of the steam, alternately to the opposite ends of the piston cylinder, as will more fully hereinafter appear in the description of the operation of the valve.

The numerals 23, and 24, indicate two short longitudinal ports or recesses at opposite ends of the valve, which are provided with offset recesses 25, and 26, at one corner for the purpose set forth.

The numeral 26^a, indicates a short rod which passes through a stuffing box 27^a, at one end of the valve chest, whereby the valve may be moved at the start if necessary by simply pushing said rod with the hand.

The valve at one side and midway between its ends is provided with cogs 27, which intermesh with the cogged head 28, mounted on the valve rod 29.

The numeral 30, indicates the piston rod, which is made hollow, and within it extends the said valve rod 29. The said rod is provided with a head 30^a, within the bore of the piston rod. The valve rod is about seven-sixteenths parts less in length than the length or distance of movement of the piston, and as the said piston reciprocates, it operates to reciprocate the valve rod just before the completion of the stroke of the piston, thereby rocking or oscillating the valve to cut off steam at one side of the piston, and admit it at the other side alternately.

The hollow piston rod 30, passes through a stuffing box 31, on the lower head of the steam cylinder 2, and through a similar stuffing box 32, on the head of the pump cylinder, extending into the pump cylinder where it is provided with a piston 33, (Fig. 12.) The said pump cylinder is provided with passages 34, and 35, Figs. 3, and 12, extending from a point midway between its ends, to said ends of the cylinder as shown in Fig. 12, of the drawings.

The numeral 36, indicates the valve chest of the pump cylinder. This is located at one side and is cast integral with it. The said valve chest is divided into a series of parallel chambers 37, 38, 39, and 40, 41, and 42, by means of vertical and horizontal partitions 43, and 44. The central chambers 38, and 41, communicate respectively with the respective ends of the pump cylinder by means of the passages 34, and 35, as shown in Figs. 3, and 12, of the drawings. The partitions 44, are provided with openings over which are seated the upwardly operating valves 45, and 46, for the purpose hereinafter set forth.

The numeral 46^a, Figs. 1, and 2, indicates a flanged plate which is bolted to the face of the valve chest of the pump, the said plate being provided with an induction port 47, and an eduction port 48.

The numeral 49, Fig. 6, indicates a frame having curved lugs at its lower end which set over the pintles of the hinge valves 50, and hold the same to their seats, the frame being provided with outwardly extending arms 51.

The frame 46, is of such size as to fit closely in the back part of the valve chambers; the arms 51, fitting closely between the sides of the chambers, so as to prevent any vertical or lateral play of the frame and hold the valves securely. By this construction provision is made for cheaply and expeditiously renewing the valves when worn or impaired. The arms also serve to limit the upward movement of the valves so that when fully lifted they are in position for certain and instantaneous closure.

Having thus fully described the construction of my invention I will now proceed to describe its operation.

As shown in Fig. 3, of the drawings, the piston in the steam cylinder is nearly at the end of its upward stroke, the live steam flowing in through the ports 16, 22, 10, and 8, and exhausting through the ports 7, 9, 20, and 13, just before the piston reaches the limit of its upward stroke, the bottom of the bore of the hollow portion of the piston rod 30, will strike the head of the valve rod 29, and carry it upward oscillating the valve seven-sixteenths of a rotation, which, with the longitudinal movements of the valve seven sixteenths of its travel, will bring one of the offset recesses 25, in connection with its corresponding inlet port 11, and the other in connection with its exhaust port 12, allowing the steam which has been cushioned during the longitudinal movement to exhaust. The reciprocating motion of the piston in the steam cylinder causes a corresponding movement of the piston in the pump cylinder. Upon the upward movement of the pump piston, water is drawn into the chamber 39, and from thence into the cham-

ber 38, and from there it is drawn through the passage 34, into the port at the lower end of the pump cylinder. Upon the reverse or down stroke of the piston, it will force the water from the pump cylinder back through the same course into the chamber 38 seating the valve 46, and lifting the valve 45, in the chamber 37, will enter the latter chamber and from this point will be carried off through the discharge. Simultaneously with the action of the pump the water which has been let into the chamber 42, will unseat the valve 46, and filling the chamber 41, will be sucked at each alternate stroke through the channel 35, leading from the chamber 41, and communicating with the opposite or upper end of the piston cylinder, so that the water sucked from the chamber 41, into the upper end of the cylinder, will be forced back through the same course at each alternate stroke of the piston, and as such water is forced back into the intermediate chamber 41, it will seat the valve 46, thereof and lift the valve 45, of the chamber 40, so that the water may fill this latter chamber and be ejected therefrom.

Having thus described my invention what I claim is:

1. The combination with the engine cylinder and its valve chest, having inlet and discharge ports as described, of the reciprocating and oscillating valve provided with longitudinal ports at its ends, the said ports provided with offset recesses at one of their corners and adapted to operate as described to cushion the valve during the major portion of its movement and permit the steam to gradually escape when nearing the end of its stroke, to prevent the hammering of the valve against the ends of the valve chest substantially as specified.

2. The combination with the steam cylinder and its ports, of the seat on the top of the cylinder having inlet and exhaust passages, the valve chest having ports and passages registering with the ports and passages in the seat, the flanged plate having a steam chest and recesses, and fitted to the upper part of the valve chest, and the valve having short ports or recesses at each end with offset recesses adapted to connect and disconnect with the inlet and outlet ports of the valve chest, so as to cushion the valve during the greater portion of its travel and permit the exhaust of the steam near the end of each stroke, substantially as specified.

3. The combination with a piston cylinder and a steam chest; of a valve chest interposed between the cylinder and steam chest, and having the two inlet ports in one side, and the two obliquely aligned inlet ports in the opposite side, and a single exhaust in communication with the latter ports, and a rocking reciprocating valve having two transversely inclined ports to alternately communicate with the obliquely aligned inlet ports and alternately open and close the single exhaust from the latter inlet ports, substantially as specified.

4. The combination with a piston cylinder and a steam chest; of a valve chest interposed between the cylinder and steam chest, and having the two inlet ports in one side, and the two obliquely aligned inlet ports in the opposite side, and also having a single exhaust situated between the respective ports, and a rocking reciprocating valve arranged in the valve chest and having a transverse port always in communication with said exhaust port, and two transversely inclined inlet ports adapted to establish communication alternately with the aligned inlet ports of the valve chest, and alternately convert the ports at one side of the valve chest into inlet and exhaust ports, respectively as set forth.

5. The cylindrical valve having the transverse port or recess at or about midway of its length, and also having rack teeth in a plane transversely therewith, and further provided with two transversely inclined receiving ports and two short longitudinal ports at opposite ends having offset recesses arranged out of line with each other, substantially as and for the purposes set forth.

6. The cylindrical valve constructed as described, and having the short longitudinal ports at opposite ends provided with the offset recesses arranged out of line with each other, in combination with a valve chest having transverse exhaust ports, and inlet ports near opposite ends also arranged out of line with each other in a transverse plane, whereby the valve in its rocking reciprocatory movement will bring the offset recesses of its longitudinal ports alternately in communication with said inlet ports of the valve casing, and the exhaust ports of said casing will be likewise alternately brought in communication with the opposite ends of the said valve casing to cushion and exhaust, substantially as specified.

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

ALFRED R. BOLUSS.

Witnesses:
OTTO CROUSE,
JOHN A. BLAIR.