No. 650,017. Patented May 22, 1900.

W. B. MANN.

QUICK ACTION TRIPLE VALVE.

(Application filed Dec. 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

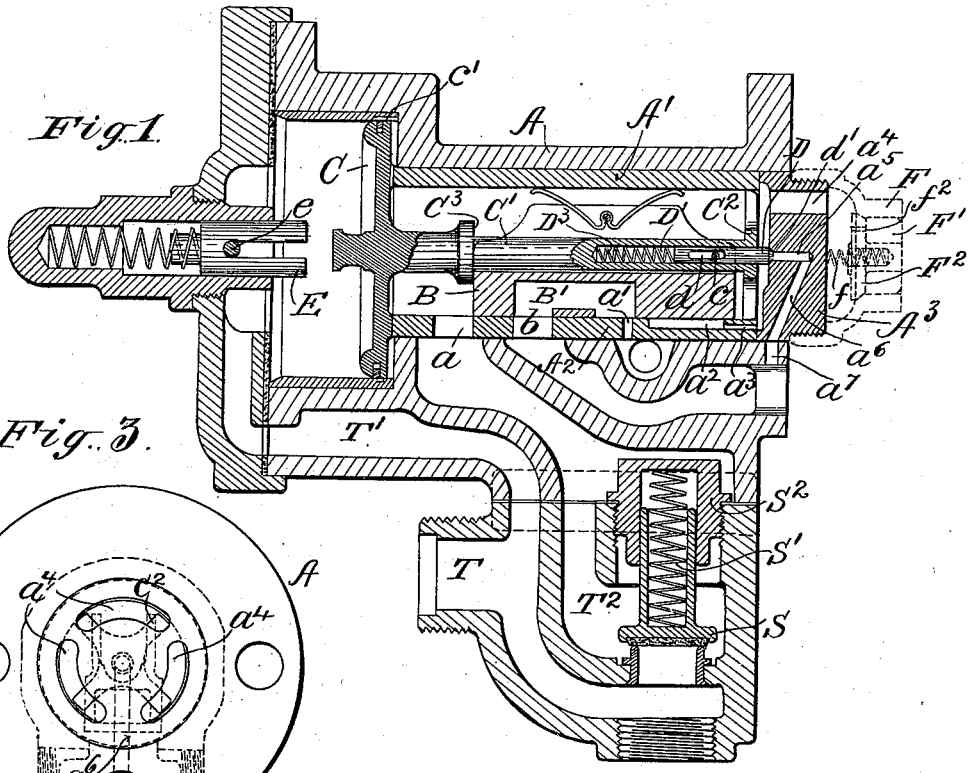
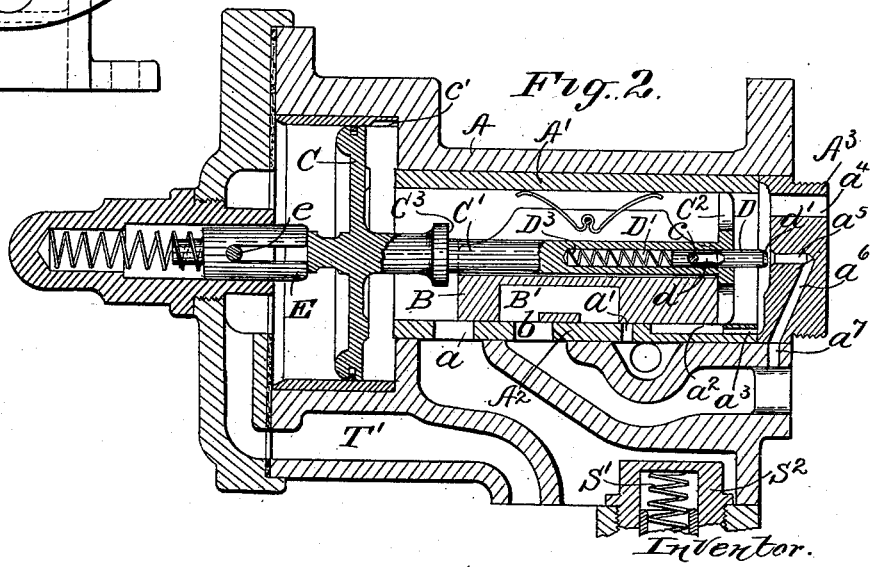


Fig. 3.

Fig. 2.



Witnesses.
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J. T. Cameron

Inventor.
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by Philip Mann,
his Attorney.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

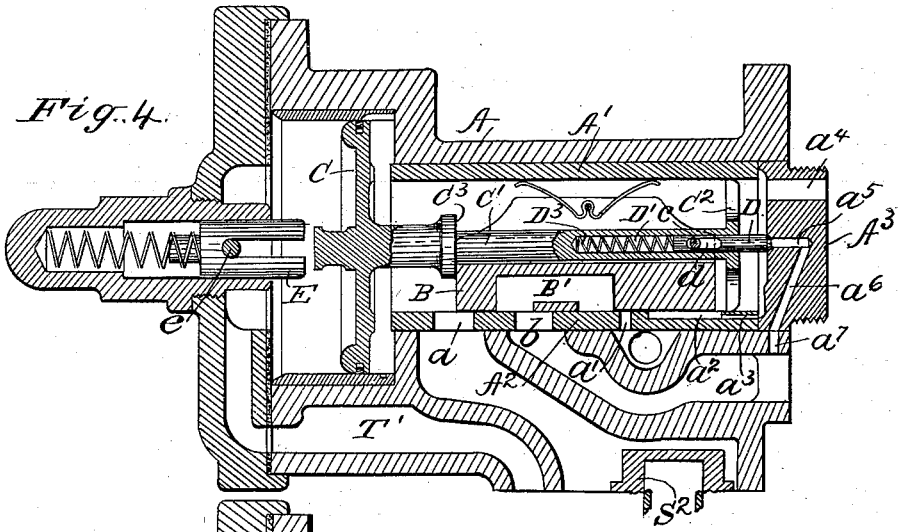


Fig. 5.

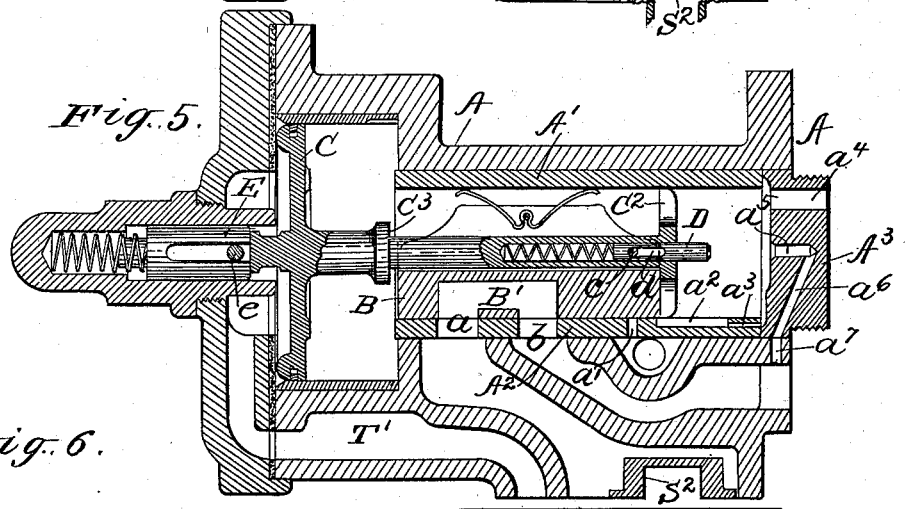
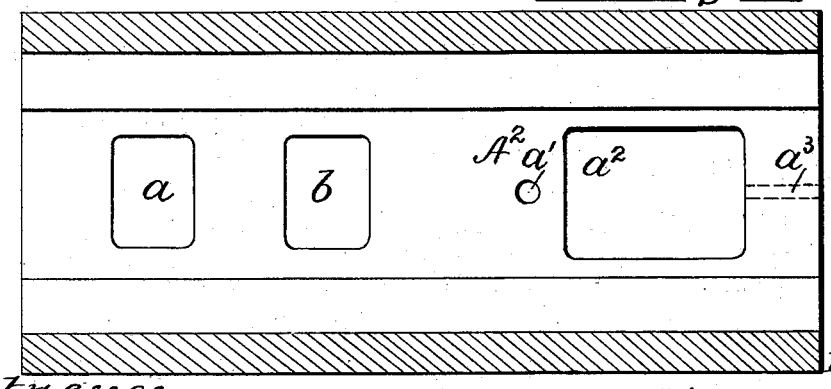


Fig. 6.



Witnesses.
W. R. Edelen.
S. T. Cameron

Inventor
William B. Mann,
by Philip Mann,
his attorney.

UNITED STATES PATENT OFFICE.

WILLIAM BRAYTON MANN, OF BALTIMORE, MARYLAND.

QUICK-ACTION TRIPLE VALVE.

SPECIFICATION forming part of Letters Patent No. 650,017, dated May 22, 1900.

Application filed December 8, 1899. Serial No. 739,685. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRAYTON MANN, of Baltimore, Maryland, have invented a new and useful Improvement in Quick-Action Triple Valves, which invention is fully set forth in the following specification.

My invention relates to triple valves for air-brakes, and more particularly to what are known as "quick-action" triple valves. In valves of this class as the same are in practical operation on railroads at the present time the service and emergency applications of the brakes are controlled by means of a triple-valve-operating piston having a partial traverse of its cylinder for service applications and a full or further traverse of its cylinder for emergency applications, and the rapid serial venting of the train-pipe, upon which the quick serial operation of all the triple valves on a train depends, is secured through the medium of certain valves and pistons additional to the triple valve proper. Furthermore, with the valves now in practical use the process of charging the auxiliary reservoirs is very slow, and where it becomes necessary to recharge the auxiliary reservoirs while the train is on long grades resort has been had to retaining-valves to retain a predetermined pressure in the brake-cylinders, to the end that the train might not acquire too great a momentum before the auxiliary reservoirs could be charged and the brakes again applied.

One object of my present invention is to provide a quick-action triple valve controlled by a piston having a partial and full traverse for service and emergency applications, respectively, as heretofore, and in which all the results of a quick-action triple valve shall be secured through the action of the triple valve proper without any additional valves or pistons for that purpose.

A further object is to provide a quick-action triple valve controlled by a piston having a partial and a full traverse for service and emergency applications, respectively, in which air is vented from the train-pipe to the brake-cylinder for emergency applications without the use of any piston or auxiliary valve additional to the triple valve proper.

A still further object is to provide a quick-action triple valve controlled by a piston having a partial and a full traverse for service and emergency applications, respectively, in which the auxiliary reservoir may be instantly recharged, whereby the brakes may be released, the auxiliary reservoirs recharged, and the brakes reapplied so quickly that the train will not get beyond control even on a steep grade, and the use of the objectionable retaining-valves may be dispensed with; and, finally, the object of my invention is to simplify the construction of quick-action triple valves, to the end that they may be more cheaply manufactured and more reliable in operation.

With these objects in view the invention consists in a main valve which alone controls the passage of air from the brake-cylinder to the atmosphere to release the brakes and from the train-pipe to the brake-cylinder for emergency applications and a graduating-valve which alone controls the passage of air from the auxiliary reservoir to the brake-cylinder for both service and emergency applications, combined with a valve-operating piston which has a partial traverse for service applications of the brakes and a full or further traverse for emergency applications thereof.

Furthermore, the invention consists in a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications, combined with a main valve which alone controls the passage of air from the brake-cylinder to the atmosphere for releasing the brakes and from the train-pipe to the brake-cylinder for emergency applications, and a graduating-valve which alone controls the passage of air from the auxiliary reservoir to the brake-cylinder both for emergency and service applications, said valves being located in a valve-chamber through which air is free to pass in large volume from the train-pipe to the auxiliary reservoir at all times when the train-pipe pressure equals or exceeds auxiliary-reservoir pressure; and, finally, the invention consists in certain improvements in the details of construction and operation of parts, all of which will be hereinafter described and then particularly pointed out in the claims.

My invention may assume various mechanical forms, one of which I have illustrated in the accompanying drawings; but it is to be

understood that such drawings are designed merely to illustrate the inventive idea and not as defining the limits thereof.

In said drawings, Figure 1 represents a central longitudinal vertical section of my triple-valve device, the parts being in release position. Fig. 2 is a similar view with the parts in the position which they occupy when graduating. Fig. 3 is an end elevation of Fig. 1 looking from the right. Fig. 4 is a view similar to Fig. 2 with the parts in position to hold air in the brake-cylinder, but without permitting the passage of any additional pressure from the auxiliary reservoir to the cylinder. Fig. 5 is a view similar to Fig. 1, the parts being shown in emergency position; and Fig. 6 is an enlarged plan view of the valve-seat.

In said drawings, A is a valve-casing having therein a bushing A′, within which is formed the usual valve-seat A^2 for the main slide-valve B. This valve-seat has formed therein a large port *a*, leading to the train-pipe, a large port *b*, leading to the brake-cylinder, and a small port *a′*, leading to the atmosphere. Furthermore, said valve-seat has formed in the bottom thereof a cavity a^2 and a duct a^3, leading from said cavity to the end of the bushing in which the valve-seat is formed. If desired, instead of the duct a^3 the cavity itself, when communication is had with the auxiliary reservoir, may extend to the end of the valve-seat. A^3 is a block of metal firmly seated within that end of the casing A adjoining the auxiliary reservoir and has formed therein suitable openings a^4, (see Fig. 3,) leading from the auxiliary reservoir into the valve-chamber. Formed within the body of the block A^3, and preferably in the center thereof, is a duct a^5, leading from the valve-chamber some distance into the block A^3 and communicating with a second duct a^6, likewise formed in said block and leading to a port a^7, formed in the valve-casing A and communicating with the brake-cylinder.

C is the valve-operating piston of usual construction, whose valve-stem C′ extends through the main-valve chamber and has formed on its extreme end the spider C^2, between which and shoulder C^3 on said piston-stem is located the main valve B, the distance between the spider C^2 and the shoulder C^3 being slightly greater than the length of the slide-valve B, so that there is a small amount of lost motion between the slide-valve and the piston-rod. This slide-valve B has formed therein a large duct or cavity B′, which in release position connects the brake-cylinder and atmosphere ports and in emergency position connects the train-pipe and brake-cylinder ports, as will be hereinafter described. Operatively connected to the piston-rod, but independent of the slide-valve, is a graduating-valve, here shown as a stem-valve D, playing in the bore D′, centrally formed in the piston-rod, the valve D having on its inner end a slot *d*, through which extends a pin *c*, connected to the piston-rod. A spring D^3 is located in the bore D′ to the rear of the graduating-valve D and has a tendency to force the graduating-valve out of the bore D′. This graduating-valve, as shown, is in alinement with the valve-seat *d′*, formed in the duct a^5, and when the parts are in release position said graduating-valve is held by the spring D^3 upon said valve-seat, so as to prevent the passage of air from the valve-chamber into the duct a^5.

E is a yielding abutment, here shown as a spring-pressed button normally projecting into the cylinder of the piston C, the pin *e* determining the amount of such projection.

T is the point of connection with the train-pipe, from which point air flows unobstructedly through the passage T′ to the rear of the piston C.

T^2 is a second passage connecting the train-pipe T with the large port *a* in the valve-chamber, and S is a check-valve arranged in said passage T^2 and opening under influence of pressure in the train-pipe toward the auxiliary reservoir and against the tension of its spring S′. The tension of the spring S′ can be adjusted by means of the screw-cap S^2 in a way which will be clearly understood.

In the operation of the triple valve the piston C has a partial traverse of its cylinder for making service or graduating application of the brakes and a full traverse of its cylinder for emergency application thereof, the extent of the partial traverse being determined by the contact of the piston with the yielding abutment or spring-button E, as is shown in Fig. 2.

For the purpose of reducing the friction between the slide-valve B and its seat, thereby rendering the said valve quite sensitive to the movements of the piston C, I have formed in the valve-seat A^2 the cavity a^2, hereinbefore referred to, which cavity when the valve is in the release position shown in Fig. 1 is connected to the valve-chamber and auxiliary reservoir, as by the duct a^3. The particular advantage of this arrangement lies in the fact that the pressure in the valve-chamber above the valve and which tends to hold it firmly to its seat is to a certain extent counteracted by the pressure in the cavity a^2, so that the friction of the valve upon its seat is greatly reduced, thereby rendering it much more sensitive in its movements.

As thus far described it will be observed that the passage of air from the train-pipe to the auxiliary reservoir may be through the large passage T^2, port *a*, main-valve chamber, and openings a^4, as well as by way of the piston-cylinder and the usual feed-in duct *c′*, so that the auxiliary reservoir may be quickly charged from the train-pipe. In case, however, it is desired to have the auxiliary reservoir charged more slowly, as is now done with the standard Westinghouse valve, I may employ the construction shown in dotted lines at the right-hand side of Fig. 1, wherein F represents a cap screwed or otherwise secured

upon the end of the block A^3, projecting into the auxiliary reservoir and having an opening F′ therethrough. F^2 is a valve seated on a valve-seat in said opening F′ and opening toward the main-valve chamber against the tension of the spring *f*, while f^2 is a small feed-in duct through said valve.

The operation of my improved triple-valve mechanism is as follows:

Charging or release position.—When air is admitted to the train-pipe from the main reservoir, it enters the passage T′ and the cylinder of the piston C and throws the piston to the position shown in Fig. 1 in advance of air which enters the valve-chamber through the passage T^2, because the movement of the air through said passage is delayed by the check-valve S. The pressure, however, in the train-pipe raises the valve S against the tension of its spring S′ and the air passes through the passage T^2, port *a*, the main-valve chamber, and passage a^4 in large volume to the auxiliary reservoir, thereby quickly charging the same. The movement of the piston to the position shown in Fig. 1 carries with it the slide-valve B, so that the large cavity B′ therein connects the brake-cylinder port *b* and the port *a*′ whereby the brake-cylinder is vented to the atmosphere and likewise seats the graduating-valve D upon the seat *d*′, where it is firmly held by the action of the spring D^3. It is to be observed that this action of the graduating-valve takes place without any injurious jar or strain upon the parts by reason of the yielding tension of the spring D^3, notwithstanding which the graduating-valve is accurately seated and firmly held in place.

Graduating position.—When it is desired to admit a limited amount of air from the auxiliary reservoir to the brake-cylinder for graduating purposes, the engineer slightly lowers the pressure in the train-pipe, thereby causing the piston C to make a partial traverse of its cylinder until the valve B closes the atmosphere-port *a*′ and said piston comes in contact with the yielding abutment E. It will be understood that since the pressure in the train-pipe is less than that in the valve-chamber such excess of pressure in the chamber, together with the spring S′, holds the check-valve S firmly seated. The movement of the piston from the position shown in Fig. 1 to that shown in Fig. 2 causes the pin *c* on the piston-stem to travel in the slot *d* on the graduating-valve until it contacts with the rear end of said slot, which occurs just before the piston comes in contact with the yielding abutment E, after which the piston-stem and the graduating-valve D move together until the piston is brought to rest by contact with the abutment E, thereby withdrawing valve D from its seat *d*′ and permitting air to pass from the auxiliary reservoir to the brake-cylinder via openings a^4, the slide-valve chamber, ducts a^5 a^6, and port a^7, which air thus escaping from the auxiliary reservoir to the brake-cylinder lowers the pressure in the valve-chamber slightly below that in the train-pipe, whereupon the piston C moves from the position shown in Fig. 2 to that shown in Fig. 4—*i. e.*, until the graduating-valve D is again seated on the seat *d*′—but without any movement being imparted to the slide-valve B, which valve remains in position to disconnect the brake-cylinder from the atmosphere-port without obstructing the free passage of air through the port *a*. This graduating action may be repeated as often as found desirable in the manner well understood in the operation of triple valves of this class.

Emergency operation.—If it be found desirable to produce an emergency operation of the brakes at any time, the valve may be shifted from any one of the positions shown in Figs. 1, 2, or 4 to such emergency position shown in Fig. 5 by a large and sudden reduction of train-pipe pressure, when the valve-actuating piston C will make the full traverse of its cylinder, forcing back the abutment E against the tension of its spring and moving the slide-valve B to the position where the enlarged opening or cavity B′ therein will connect the large ports *a b*, whereupon train-pipe pressure will raise the check-valve S and rush in large volume through the passage T^2, port *a*, duct B′, and port *b* to the brake-cylinder, thereby securing the reduction in train-pipe pressure upon which quick serial action depends. Should it be found desirable to recharge the auxiliary reservoir during a service application of the brakes, this may be almost instantaneously accomplished by the engineer throwing his engineer's valve to release position, whereupon the air will pass in large quantities through the passage T^2 and the valve-chamber to the auxiliary reservoir, immediately after which the parts may again be thrown to graduating position, the whole operation being accomplished so quickly that even on heavy grades a train would not acquire such momentum as to get beyond the control of the brakes. By this means I am enabled to dispense with the use of retaining-valves and the delay incident to charging up all of the auxiliary reservoirs on a long train. Furthermore, should there be any slight leak in the brake-cylinder air may be slowly passed, by way of the passage T^2 and the port *a*, to the auxiliary reservoir even when the parts are in graduating position.

What I claim is—

1. In a quick-action triple valve, the combination of a main valve through which air passes from the train-pipe to the brake-cylinder for emergency applications and from the brake-cylinder to the atmosphere to release the brake and a graduating-valve which controls the passage of air from the auxiliary reservoir to the brake-cylinder independently of the main valve, with a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications.

2. In a quick-action triple valve, the combination of a main valve which alone controls the venting of the train-pipe for emergency applications of the brakes and the release of air from the brake-cylinder with a graduating-valve independent of the main valve and controlling the passage of air from the auxiliary reservoir to the brake-cylinder, with a triple-valve-operating piston having a partial traverse for service applications and a full or further traverse for emergency applications.

3. In a quick-action triple valve, the combination of a main valve which alone controls the venting of the train-pipe for emergency applications of the brakes and a graduating-valve controlling the passage of air from the auxiliary reservoir to the brake-cylinder independent of the main valve with a triple-valve-operating piston having a partial traverse for service applications of the brakes and a full or further traverse for emergency applications.

4. A quick-action triple valve composed of a valve-chamber, a main slide-valve therein having a single duct which connects the train-pipe with the brake-cylinder when the parts are in emergency position and the brake-cylinder and atmosphere when the parts are in release position, a valve-operating piston in operative relation with said slide-valve, a graduating-valve operated by said piston and at all times controlling the passage of air from the auxiliary reservoir to the brake-cylinder independently of the main slide-valve, and a check-valve between the brake-cylinder and train-pipe and closing toward the latter.

5. In a quick-action triple valve, the combination of a valve-chamber, having large ports opening to the auxiliary reservoir, the train-pipe and the brake-cylinder, and restricted ports opening to the brake-cylinder and the atmosphere, with a main slide-valve having a single duct therein which connects the train-pipe and large brake-cylinder ports when the parts are in emergency position and the large brake-cylinder and atmosphere ports when the parts are in release position, a graduating-valve controlling the restricted brake-cylinder port independently of the main slide-valve, and an operating-piston for said main and graduating valves.

6. In a quick-action triple valve the combination of a valve-chamber having large ports opening to the auxiliary reservoir and brake-cylinder and a small port opening to exhaust, a main slide-valve having a duct connecting said brake-cylinder and exhaust ports when the parts are in release position, a restricted port opening from the auxiliary reservoir to the brake-cylinder, a graduating-valve controlling said restricted port independently of the main valve, a triple-valve-operating piston operatively connected to said main and graduating valves, a passage leading from the train-pipe and entering the valve-chamber through a large port in front of said piston and a check-valve in said passage.

7. In a triple-valve structure the combination of a valve-chamber having ports leading to the atmosphere and to the brake-cylinder, a main valve having a duct therein connecting the said ports when the valve is in release position, an extended imperforate portion of said valve closing the atmosphere-port in all positions except release, and an extended cavity in the valve-seat located under said extended portion of the main valve except when the latter is in emergency position, said cavity being in free communication with the auxiliary-reservoir pressure.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM BRAYTON MANN.

Witnesses:
LEVEN J. GWINN,
JOHN J. MOORE.