

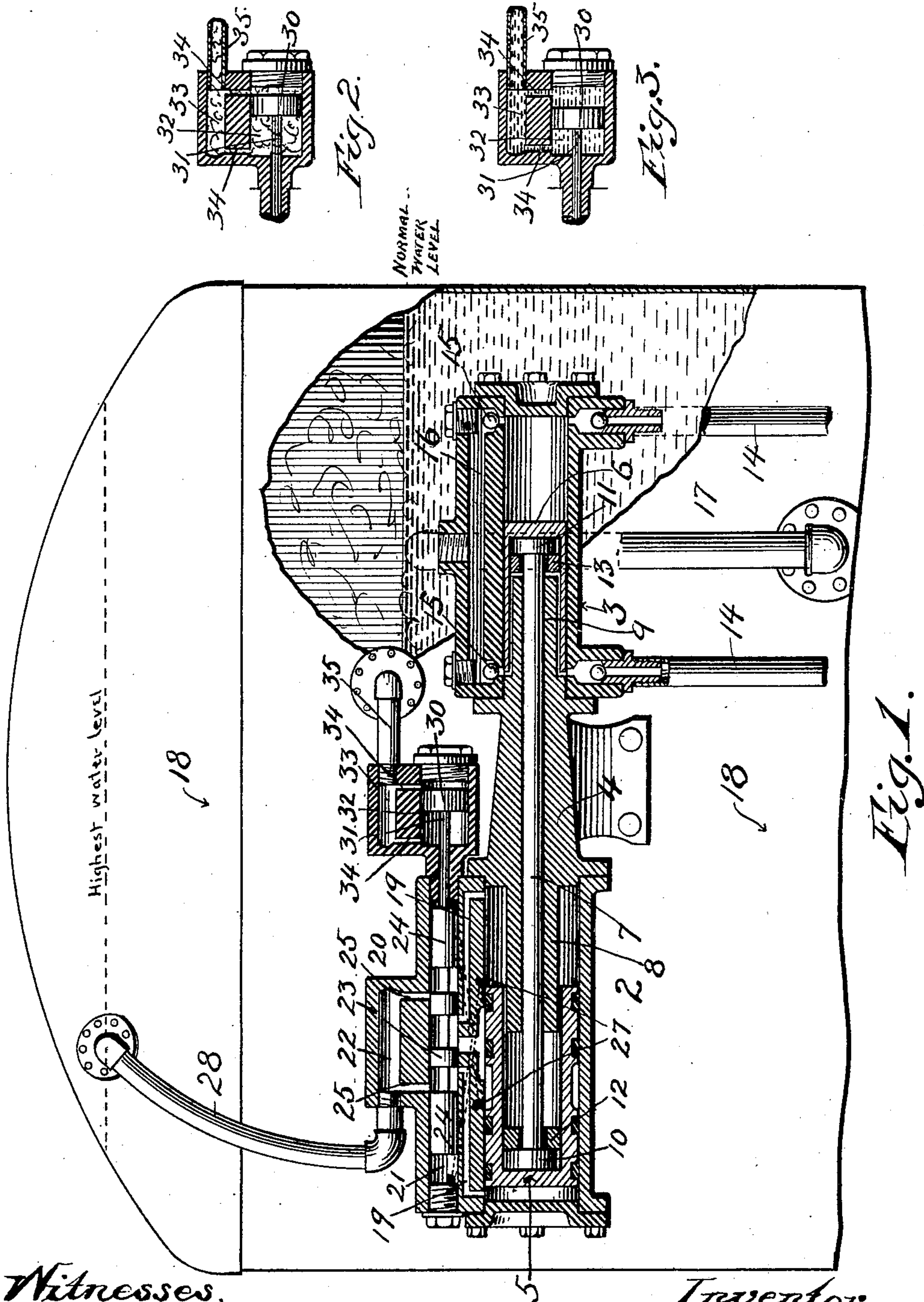
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Patented Aug. 13, 1901.

A. G. MCPHERSON.
BOILER FEED REGULATOR.

(Application filed Oct. 18, 1900.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

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ONE-HALF TO GEORGE B. FOSTER, OF CHICAGO, ILLINOIS.

BOILER-FEED REGULATOR.

SPECIFICATION forming part of Letters Patent No. 680,347, dated August 13, 1901.

Application filed October 18, 1900. Serial No. 33,511. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR G. MCPHERSON, of the city of Highland Park, county of Lake, and State of Illinois, have invented
5 certain new and useful Improvements in Boiler-Feed Regulators, of which the following is a specification.

My invention relates to means for regulating the feed or supply of liquid to a boiler or
10 like reservoir, whereby a desired water-level may be maintained therein. Hitherto it has been the practice to employ float-valves in steam-boilers for the purpose of regulating the flow of water thereto and cutting off said
15 flow at a desired height; but difficulty has always been experienced in the use of such float mechanisms, the same frequently failing to act when they should, with the result that the supply of water is either shut off, so
20 that the boiler is permitted to go dry or, on the other hand, it is not properly regulated, so that the boiler is completely filled with water, owing to the continued operation of the steam pump or injector which such mech-
25 anism is supposed to regulate.

One object of my invention is to provide a feed-regulator that is dependent upon and is controlled solely by the vapor and the liquid in or from the boiler or reservoir and which
30 will be of an extremely-simple construction and reliable in operation.

A further object of my invention is to generally cheapen and simplify the whole mechanism that is employed for supplying or feed-
35 ing water or liquid to boilers or reservoirs, so constructing and arranging said mechanism that it will be practically impossible for the same to get out of order or fail to respond to all the requirements of such mechanisms.

40 My invention consists generally in the combination of a boiler or reservoir, preferably one wherein a pressure or vapor is normally maintained, with a pump-injector or like device for feeding or supplying liquid to said
45 boiler and means provided in connection with said pump whereby the operation thereof is controlled, retarded, or stopped by the flow of liquid from or at the approximate normal water-level in said boiler; and my invention
50 further consists in various constructions and in combinations of parts, all as hereinafter

described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying draw- 55
ings, forming a part of the specification, in which—

Figure 1 is a sectional view of an automatic steam-pump and pump-regulator embodying my invention. Figs. 2 and 3 are like sec- 60
tional views of the regulator alone.

My invention consists, primarily, in any feed-regulator that is operated by or is dependent upon a flow of liquid at or from a normal liquid-level of the reservoir or boiler; 65
and further, my invention consists in any regulating means by which the flow of liquid to the boiler is impeded or decreased in volume from the moment the liquid in the boiler reaches a predetermined level and which reg- 70
ulating means are further capable of entirely shutting off the supply to the boiler when the liquid therein has risen to the highest permissible level and before the boiler is completely filled. 75

From the foregoing statements it will be realized that the scope of my invention is broad and that the same includes any mechanism wherein liquid taken from the water-level height in the boiler operates through its 80
mere presence in the path of a moving steam-valve to retard or brake the action or rapidity of movement of said valve, thus cutting down the speed of the pump or the supply mechanism that is controlled by said valve. 85

Further, my invention will be understood to include within its scope any form of movable valve that is interposed in a steam-supply pipe of the supply-pump or other device and which valve normally admits of the pas- 90
sage of sufficient steam to operate said pump at a speed adequate to the maintenance of a desired water-level in the boiler, but which valve is adapted for actuation by pressure of liquid from the water-level in the boiler or by 95
the clogging of water therein to cut off the flow of steam to the pump, and my invention also embraces within its scope any valve mechanism that is actuated to control the pump or other supply means by a mere liquid-pressure. 100

Perhaps the greatest difficulty encountered in the feeding of boilers of various types has

been met with in connection with steam-motor vehicles or automobiles wherein the feed-pumps operate only during the operation of the propelling-engines, while the burners or other heating means employed for the generation of steam are often left or permitted to run at full temperature while the vehicles are at a standstill. Many automobile boilers have been burned as a result of such carelessness or neglect, and, on the other hand, many automobiles have been brought to a standstill after running for a considerable time under a light load, during which time the supply of water is disproportionate to the volume of steam used, in which case there is always danger that a boiler will be completely filled with water. A particular object, therefore, of my invention is to provide for the accurate and reliable feeding of automobile boilers, and the difficulties pointed out in the foregoing are overcome by the employment of a pump and regulating mechanism like unto that shown in Figs. 1, 2, and 3 of the drawings. In said figures I have shown an automatic steam-pump that is supplied with steam from the boiler and operates continuously so long as its operation is not impeded by the automatic brake or regulator. The pump comprises the steam cylinder 2 and the water-cylinder 3, which are arranged at opposite ends of the frame-section 4. In each cylinder is a piston 5 6, respectively, which pistons are connected by the piston-rod 7. The pistons are cup-shaped, and the frame-section has the long sleeves or bosses 8 and 9 extending into the cylinders 2 and 3, respectively. These sleeves and the solid portion of the frame are bored to fit the piston-rod 7 and furnish so long a bearing that I am able to wholly dispense with stuffing boxes or glands about the piston-rod. The cylinders may be turned into any desired position upon the frame. To obviate the necessity of exact alinement between the cylinders 2 and 3, I prefer to provide the heads 10 11 upon the ends of the piston-rod 7, said heads being smaller than the cavities within the pistons and being held by the retaining rings or shoulders 12 13 in said pistons, the openings in said rings being considerably larger than the piston-rod, whereby said pistons are permitted a considerable variance from concentricity with the axis of the piston-rod. 14 14 are the water-supply pipes, provided with suitable valves that communicate with opposite ends of the water-cylinder 3. The water is discharged from said cylinder 3 through valves 15 and into the cavity 16, from whence the water is forced through the feed-pipe 17, leading into the boiler 18. The steam-cylinder is provided with the usual pair of steam-ports 19 and the exhaust-port 20, and said steam-cylinder is provided with a steam-chest, comprising the valve casing or cylinder 21 and the steam-cavity 22. In the cylinder 21 I provide a piston-valve 23, which with the plungers 24 on the ends there-

of is of less length than the valve casing or cylinder 21. Ports 25 lead from the cavity 22 into the casing 21 to be alternately opened and closed by the valve 23, whereby steam is let into the ports 19 alternately to operate the steam-piston 5. As said steam-piston 5 approaches the end of its stroke in each direction it opens the small ports 27, from which ducts (see dotted lines) extend to opposite ends of the valve-casing 21, whereby the valve 23 is made to alternate with the piston 5 in its action. 28 is the steam-pipe which leads from the top of the boiler to the cavity 22 to supply steam to the pump. This steam-pipe preferably drops away from the point of its connection with the boiler, which connection is located at the highest permissible level for water in said boiler—that is, there will always be a volume of steam in the boiler, for the reason that as soon as the water reaches the level of the steam-pipe it will flow downward through said pipe and into the steam-cylinder of the pump, with the result that while said pump may continue to operate very slowly under water-pressure more water will be drawn out from the boiler than can be supplied thereto through the movement of the steam-pump, for the reason that the water-cylinder of the pump is of less capacity than its steam-cylinder. I observe this precaution against complete filling of the boiler as the only way in which to overcome such difficulty when any continuously-acting pump is employed. It is evident that the pump shown and described will be continuous in operation so long as pressure is maintained in the boiler, and while the means above described will prevent the filling of the boiler, even when steam is not being taken from the boiler—as, for instance, when an automobile is left standing for several hours with its burners in operation—it is necessary to provide some means by which the water-level in the boiler may be kept down to the normal level at all times during the usual or normal operation thereof. I accomplish this by regulating the speed of the pump and without using a float or like mechanism in the boiler.

I prefer that my regulator shall take the form shown in Figs. 1, 2, and 3, the same comprising a brake or retarding device upon and for the steam-valve of the automatic pump. This regulator or brake consists in the piston 30, connected to the valve 23 by a small rod 31 and arranged in the small brake-cylinder 32.

33 is a port-cavity wherefrom ports 34 lead into opposite ends of the cylinder 32. From said cavity 33 a pipe or connection 35 extends to and into the boiler at approximately the normal water-level therein. It is evident that at any time during the use of the boiler and as soon as the supply of water so far exceeds the evaporation thereof the water rises to or above the pipe 35. Said pipe and the cylinder 32, which has previously been

filled with steam, will be occupied by water and will be kept full of water so long as the water remains above the pipe 35. It is likewise evident that in order that the valve 23 may reciprocate it must displace either the steam or water which occupies the cylinder 32, and when said cylinder is filled with water, which is more difficult of displacement than steam, the reciprocatory speed of said valve 23 will be materially cut down, with the result that the pump will be caused to operate very slowly, the water operating as an effective braking or blocking agent. After water flows from the water-level of the boiler into the brake-cylinder the pump will continue to operate slowly until the boiler evaporation exceeds the supply of water from the pump, whereupon the water-level will fall, and when the water does fall below the pipe 35, and whether the cavity 33 is arranged above or, as I prefer, upon the side or bottom of the cylinder 32, the water in said cylinder 32 will be forced or will drain back into the boiler and steam will take the place of the water, whereupon the pump-valve being relieved of resistance to its action will again operate at its maximum speed and the pump will supply the necessary quantity of water to the boiler. In this manner I am able to secure perfect regulation of the automatic steam-pump without using any valve-floats or like mechanisms which are likely to get out of order and cause annoyance or danger.

The invention may be embodied in still other forms, devices, and systems, and I therefore do not confine my invention to the specific construction herein shown and described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a reservoir or boiler, of liquid-supply apparatus connected therewith and having the usual valve means operatively interposed between said reservoir and the valve of said apparatus for regulating the operation of said valve and hence the operation of said apparatus, and said means being connected with said reservoir at approximately the normal water-level therein, substantially as described.

2. The combination of a reservoir or boiler, wherein a vapor-pressure is normally maintained with liquid-supply apparatus connected with said reservoir and normally actuated by the pressure from said reservoir, the steam-valve of said apparatus, and means operatively interposed between said reservoir and the steam-valve of said apparatus, permitting the flow of liquid from approximately the normal water-level of said reservoir and controlling the movement and operation of said valve and said apparatus to cut down the supply of liquid to said reservoir, substantially as described.

3. The combination of a reservoir or boiler, wherein a vapor-pressure is normally maintained with liquid-supply apparatus con-

nected with said reservoir and normally actuated by the pressure from said reservoir, said reservoir having the usual steam-valve and means operatively interposed between said reservoir and the steam-valve of said apparatus, permitting the flow of liquid from approximately the normal water-level of said reservoir and thereby controlling the movement and position of said valve to cut down the supply of liquid to said reservoir, during and so long as liquid continues to flow from said reservoir at a point approximately the normal water-level therein, substantially as described.

4. The combination of a boiler or reservoir, with liquid-supply apparatus therefor having a valve and a valve-brake apparatus comprising a cylinder and a displacement-piston and a connection between said cylinder and said reservoir, at approximately the normal water-level in said reservoir, whereby liquid entering said cylinder controls the movement of said valve, substantially as described.

5. The combination with a boiler, of a steam-pump driven therefrom, for supplying water thereto, said pump provided with a suitable reciprocating steam-valve and a brake device or regulator provided in connection with said valve, comprising a cylinder that is connected with said boiler at normal water-level therein, and a displacement-piston in said cylinder attached to said valve, substantially as described.

6. The combination of the liquid-reservoir, with valved liquid-supply means capable of supplying liquid to said reservoir in excess of the normal requirement, and a regulator for the valve of said supply means, comprising a plunger operated upon by liquid when and only after the liquid-level in said reservoir has risen above the normal level and controlling the operation of said valve, substantially as described.

7. The combination of a liquid-reservoir, such as a boiler with automatic liquid-supply means, the automatic steam-valve thereof, and a regulator for said valve, comprising a mechanism for blocking or checking the operation thereof, and operated by the flow of the excess liquid in said reservoir, substantially as described.

8. The combination with a boiler, of an automatic steam-pump comprising a frame, the cylinders at opposite ends thereof, sleeves upon said frame, pistons in said cylinders, the piston-rod for said pistons extending through said frame and sleeves, the valves for said pump, steam and water connections therefor and a regulator governed by the flow of water from the normal water-level in said boiler and having its moving part connected with the steam-valve of said pump, substantially as described.

9. The combination with a boiler, of the automatic valved steam-pump, the steam connection for said pump extending from said boiler at a point near the top thereof and

adapted to be filled with water when the water rises to the highest permissible level in the boiler, and a pump-valve regulator comprising a plunger operated upon by the flow
5 of water from the normal water-level of said boiler, to check the operation of said pump-valve, substantially as described.

In testimony whereof I have hereunto affixed my name this 13th day of October, 1900.

ARTHUR G. McPHERSON.

In presence of—

C. G. HAWLEY,
T. D. BUTLER.