

No. 843,722.

PATENTED FEB. 12, 1907.

J. E. WALLACE.

AUTOMATIC FEED WATER REGULATOR FOR BOILERS.

APPLICATION FILED JULY 27, 1906.

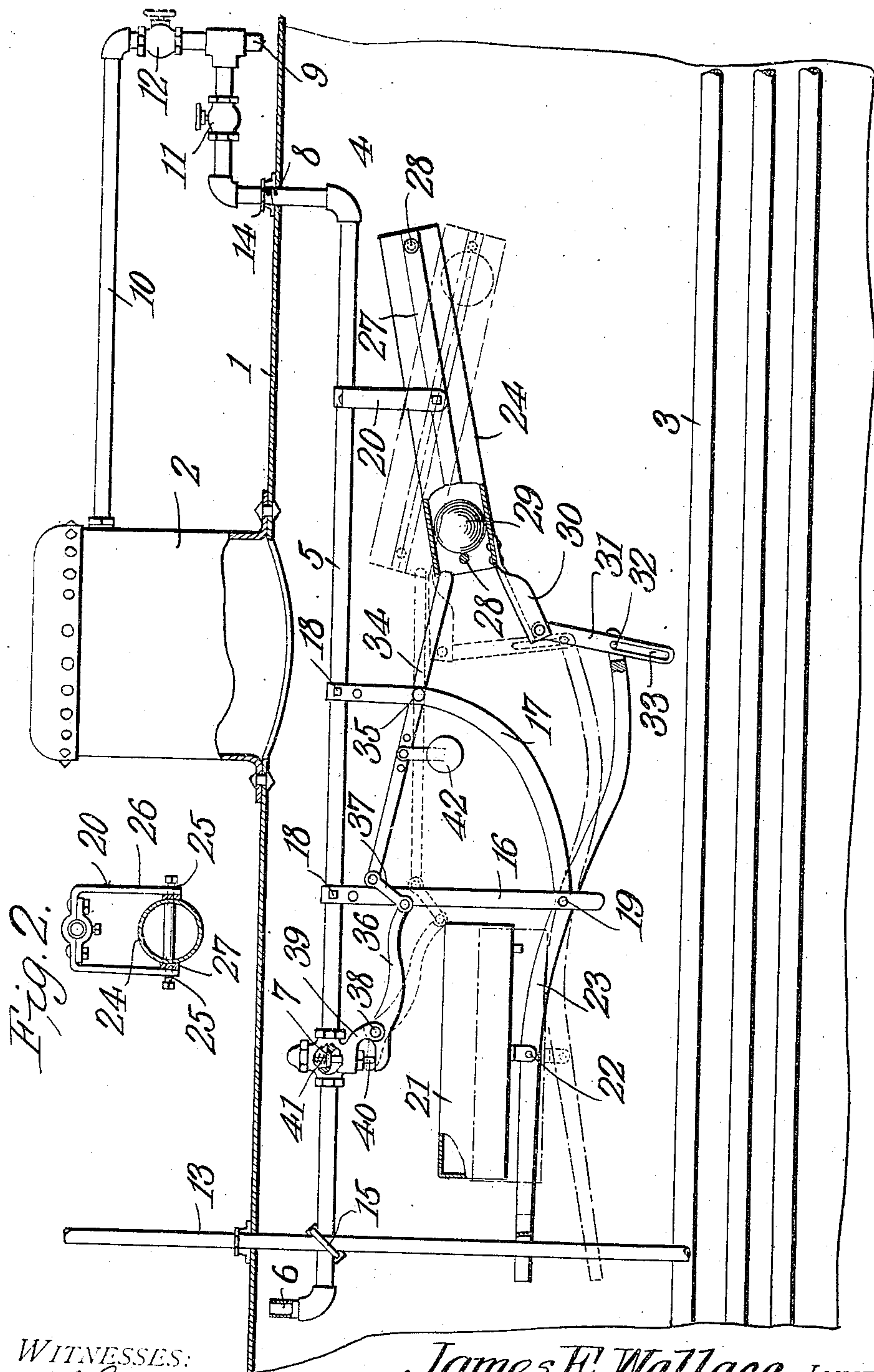


Fig. 1.

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AUTOMATIC FEED-WATER REGULATOR FOR BOILERS.

No. 843,722.

Specification of Letters Patent.

Patented Feb. 12, 1907.

Application filed July 27, 1906. Serial No. 328,139.

To all whom it may concern:

Be it known that I, JAMES E. WALLACE, a citizen of the United States, residing at Briceville, in the county of Anderson and State of Tennessee, have invented a new and useful Automatic Feed-Water Regulator for Boilers, of which the following is a specification.

This invention relates to a mechanism for automatically regulating the supply of water or other liquid to a consumption means, such as a boiler, and it relates more particularly to a feed-water regulator of the float type.

One of the objects of the invention is to provide an apparatus of this type of simple and improved construction and operation whereby the level of the water in the boiler is automatically maintained within safe and operative limits.

A further object is to construct a regulator of such a design that the operating parts thereof will be wholly contained within the boiler, thus doing away with a float-chamber exterior to and communicating with the boiler.

Another object of the invention is the employment of a means between the float and the valve that controls the supply of steam to the injector or water-pump, whereby the valve will be opened or closed positively and quickly as the float approaches the maximum high or low water limit.

With these objects in view and others, as will appear as the nature of the invention is better understood, the invention comprises the various novel features of construction and arrangement of parts, which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one of the embodiments of the invention, Figure 1 is a partial sectional view of a boiler of the flue type with the regulating mechanism in the steam-space thereof. Figure 2 is a detail sectional view of the device between the float and valve for imparting a hammer-blow to the latter for opening or cutting off the steam-supply.

Corresponding parts in the several figures are indicated throughout by similar characters of reference.

In the present instance I have elected to illustrate the regulator as an apparatus for controlling the supply of water to a boiler. I desire to have it understood, however, that the same may be used for other purposes—as, for instance, to maintain the level of a

liquid in a receptacle that serves to supply consumption devices.

Referring to the drawings, 1 designates the shell of a boiler, 2 the dome thereof, and 3 the fire-tubes. The boiler may manifestly be of any desired construction. Arranged in the steam-space 4 of the boiler is a longitudinally-extending pipe 5, having an open end 6 to admit steam thereto, the supply of steam being controlled by a valve 7, of any approved construction. The end of the pipe 5 opposite from the open end thereof extends through the boiler-shell at 8 and connected with a pipe 9, leading to a water-pump or an injector.

Extending from a suitable part of the boiler, such as the dome 2 thereof, is a pipe 10, that also connects with the supply-pipe 9. The pipes 5 and 10 are provided with hand-operated shut-off valves 11 and 12, respectively, so that the supply of steam to the ejector or water-pump can be controlled independently of the regulator—as, for instance, when the regulator becomes inoperative or when it is desired to fill the boiler when the latter is shut down and the fire banked. The valve 12 is normally closed and the valve 11 normally open, so that the supply of steam to the injector or pump will be controlled automatically by the regulator, according to the changes in level of the water in the boiler. The valve 12 is only opened under the emergency conditions above named.

The pipe 5 is held in a fixed position in the boiler, as by means of the pipe 13 adjacent its open end, and the nut 14, screwing on the pipe adjacent the point 8, so that the pipe 5 may serve as a support for the operating parts of the regulator. The pipe 13 constitutes the water-supply pipe leading from the injector or pump and discharging into the boiler. The steam-supply pipe 5 is supported on the water-delivery pipe 13 in any suitable manner, as by means of the clamp 15. At about the middle of the pipe 5 is secured a depending bracket composed of two strips of iron 16 and 17, each looped centrally on itself and straddling the pipe 5 at their looped or upper ends. These members 16 and 17 of the bracket are rigidly held in place by the binding-screws 18, that jam against the pipe. The member 16 extends downwardly in a straight line, and the member 17, which is spaced apart at its upper end from the member 16, curves toward the latter at its lower

end, and the two are bolted together by the bolts 19. At one side of the bracket is an inverted-U-shaped structure 20, that is adjustably clamped to the pipe 5. By means of this structure and the bracket the moving or operating parts of the regulator are supported on the steam-supply pipe 5.

The operating parts of the regulator comprise the following organization: A float 21 is arranged at one side of the depending bracket and below the steam-controlling valve 7. The float, which is preferably a hollow metallic vessel suitably constructed for this purpose, is pivoted at 22 on a lever 23, fulcrumed on the bolt 19 at the lower end of the depending bracket. The left-hand end of the lever is preferably forked and engages around the water-delivery pipe 13, so that the latter will act as a guide. Mounted to have an oscillatory or tilting movement on the structure 20 is a tubular holder 24. This holder is journaled intermediate its ends, so as to be balanced on pivot-bolts 25, arranged at the lower ends of the arms 26 of the structure 20. The tubular or cylindrical holder 25 is reinforced by parallel external bars 27, that are secured in place by bolts 28 at the ends of the holder. The holder 24 contains a ball 29, which is preferably of metal and of such a weight as to cause the holder to tilt with considerable force and rapidity. The bolts 28 serve to retain the ball in the holder. The left-hand end of the holder is provided with an arm 30, to the extremity of which is pivoted a slotted link 31. The free end of the float-lever 23 is connected to the link 31 by a pin 32, engaging in the slot 33, said pin and slot constituting a lost-motion connection between the float-lever and ball-holder. By this arrangement the left-hand end of the holder will be gradually raised as the float 21 lowers with the change in level of the water in the boiler. The raising of the left-hand end of the holder continues by reason of the lowering of the float until the ball is caused to roll toward the right-hand end. The ball as it moves to the right-hand end will cause the holder to tilt suddenly to the dotted-line position, this sudden movement being permitted to occur independently of the float-lever by reason of the slot 33 of the link 31. A sudden movement also accompanies the tilting of the holder when swinging from the dotted to the full line position caused by the rise in level of the water in the boiler that disturbs the position of the ball through the intervening mechanism.

The purpose of the sudden movement at the last part of the tilting of the holder in either direction is to impart a hammer-blow for opening and closing the steam-supply valve 7. This hammer-blow is imparted to the free end of a lever 34, fulcrumed at 35 on the member 17 of the bracket. The free end of the lever 34 extends slightly into the left-

hand end of the holder 24, so that as the latter tilts in one direction the bottom thereof will strike the lever, and as it tilts in the opposite direction the top will strike the lever. The opposite end of the lever 34 is connected with the lever 36 by means of a link 37, the lever 36 being fulcrumed at 38 on an arm 39 of the casing of the valve 7. The lever 36 is arranged to engage the outer end of the valve-stem 40, so as to move the valve-stem inwardly when the supply of steam to the pump or ejector is to be opened. The valve 7 is provided with a spring 41 or equivalent means, which normally tends to close the valve, and the spring is of sufficient strength to hold the levers 34 and 36 in the full-line position when the valve is closed. The lever 34 is fitted with an adjustable weight 42, which operates against the tension of the valve-spring to maintain the valve open until the change in level of the water in the boiler causes the holder 24 to tilt again and strike the lever 24 to close the valve.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily appreciated by those skilled in the art to which the invention appertains.

In describing briefly the operation the parts are shown in the position corresponding to the high-level line of the water. Hence the valve 7 is closed, so that no steam is supplied to the pump or injector. As the level of the water lowers gradually by the consumption of steam the float 21 falls and causes the ball-holder 24 to move from the full-line position to or slightly beyond a horizontal position. This change in position of the holder will cause the ball 29 to roll to the right, and thereby impart a quick tilting movement in the same direction as that caused by the lowering of the float. The holder 24 thus strikes the free end of the lever 34, so that it is tilted to the position shown by dotted lines. This movement of the lever 34 is materially assisted by the weight 42, so that the spring 41 of the valve is overcome and the valve completely unseated. Steam now enters through the open end 6 of the pipe 5 and flows to the water-supplying device, so that water is discharged into the boiler through the pipe 13. As the level of the water rises the float 21, holder 24, and intermediate parts will gradually change from the dotted-line position to the full-line position, during which movement the ball 29 will roll to the left and give an impulse to the holder, whereby the latter strikes the lever 34 and closes the steam-supply valve.

I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof; but I desire to have it understood that the apparatus shown is merely

illustrative and that various changes may be made when desired as are within the scope of the invention.

What is claimed is—

5 1. In a regulator, the combination with a boiler, and a pipe arranged in the steam-space thereof for supplying steam to a water-delivering device, of a mechanism for controlling the supply of steam through said
10 pipe, the same comprising a valve, a float, a lever supported on the pipe and connected with the float, and a means supported on the pipe and actuated by the lever for opening and closing the valve.

15 2. In a regulator, the combination of a boiler, a pipe arranged in the steam-space thereof for supplying steam to a water-delivering device, a water-delivering pipe extending into the boiler, and means for sup-
20 porting the first on the second pipe, with a controlling mechanism for regulating the supply of steam through the first-mentioned pipe.

25 3. In a regulator, the combination of a boiler, a pipe arranged in the steam-space thereof for supplying steam to a water-delivering device, a water-delivering pipe extending into the boiler, and means for supporting the first on the second pipe, with a mechanism supported on the first-mentioned pipe for
30 controlling the supply of steam through the latter, said mechanism including a float that is guided by the second pipe.

35 4. In a regulator, the combination with a boiler, and a pipe therein receiving steam from the same, of a float, a controlling-valve for the pipe, a tilting device mounted on the pipe and arranged to tilt suddenly, a lost-motion connection between the float and device
40 whereby the latter is tilted first by the float and then automatically, and means between the valve and device arranged to cause the latter to open the valve suddenly.

45 5. In a regulator, the combination of a float, a controlling-valve, a holder containing a weighted ball, a connection between the float and holder whereby the latter is gradually tilted first by the float and then suddenly by the change in position of the ball,
50 and a mechanism between the holder and valve for opening and closing the latter, with a boiler containing the foregoing mechanism of the regulator, and a steam-pipe in the boiler supporting the entire regulator mechanism and containing the controlling-valve.

55 6. In a regulator, the combination of a lever, a tilting member, means carried thereby for assisting in the tilting of the same, a link connected with the member, a slot-and-pin connection between the link and lever, a controlling-valve, and means between the valve and member and unattached to the latter and arranged to be actuated thereby.

65 7. In a regulator, the combination of a tilting device, means carried thereby for assist-

ing in the tilting of the same, a lever arranged with one end extending into the device so as to be struck by a hammer-blow from the device, and a mechanism actuated by the lever.

8. In a regulator, the combination of a tilting device having an open end, a support for the device on which the latter is journaled at its center, means arranged to assist in the tilting of the device, a weighted lever having one end extending into the open end of the
75 device to be actuated thereby, and a mechanism operated by the lever.

9. In a regulator, the combination of a float, a lever on which the float is pivotally mounted, a tilting device arranged to first
80 move gradually and then suddenly, a link connected with the device, a slot-and-pin connection between the link and lever, and a valve arranged to be opened or closed only during the sudden movement of the said device, said device comprising a hollow structure, a movable weight therein, and means
85 for pivoting the structure at its center to oscillate in a horizontal axis.

10. In a regulator, the combination of a float, a lever on which the float is mounted, a hollow tiltable member, a ball-weight movable from end to end of the member, stops on the member for retaining the ball, a structure on which the member is fulcrumed at its
95 center, a lost-motion connection between the member and lever, and a mechanism arranged to be engaged by the said member directly.

11. In a regulator, the combination of a float, a lever actuated by the float, a tilting device arranged to first move gradually and then suddenly, a lost-motion connection between the lever and device, separate levers
100 arranged to cooperate for transmitting motion from the device, a link connecting the adjacent ends of the levers, a weight adjustably mounted on one of the levers, and a valve controlled by the other of the separate levers.
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12. In a regulator, the combination of a float, a valve, and means between the valve and float for receiving motion from the latter to actuate the valve suddenly, said means comprising a tubular member, fixed pivots
115 on which the member tilts, retaining devices at the ends thereof, and a freely-movable body arranged in the member.

13. In a regulator, the combination of a support, a bracket mounted thereon, a float-actuated lever fulcrumed at one end of the bracket, a lever fulcrumed above the first lever on the bracket, a device between the levers for moving one by the other with a hammer-blow, and means on the support for
125 holding said device.

14. In a regulator, the combination of a steam-supply pipe, a bracket mounted thereon, a float-actuated lever fulcrumed on the bracket, a lever fulcrumed above the first on
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the bracket, a device between the levers for suddenly moving one by the other, a structure for adjustably supporting the device on the pipe, a valve in the pipe for controlling the supply of steam therethrough, and a lever connected with the second lever for actuating the valve.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

J. E. WALLACE.

Witnesses:

R. C. NORMAN,
JAMES FAUST.