(No Model.) 2 Sheets—Sheet 1.

D. J. REYNOLDS.

ACETYLENE GAS GENERATOR.

No. 576,893. Patented Feb. 9, 1897.

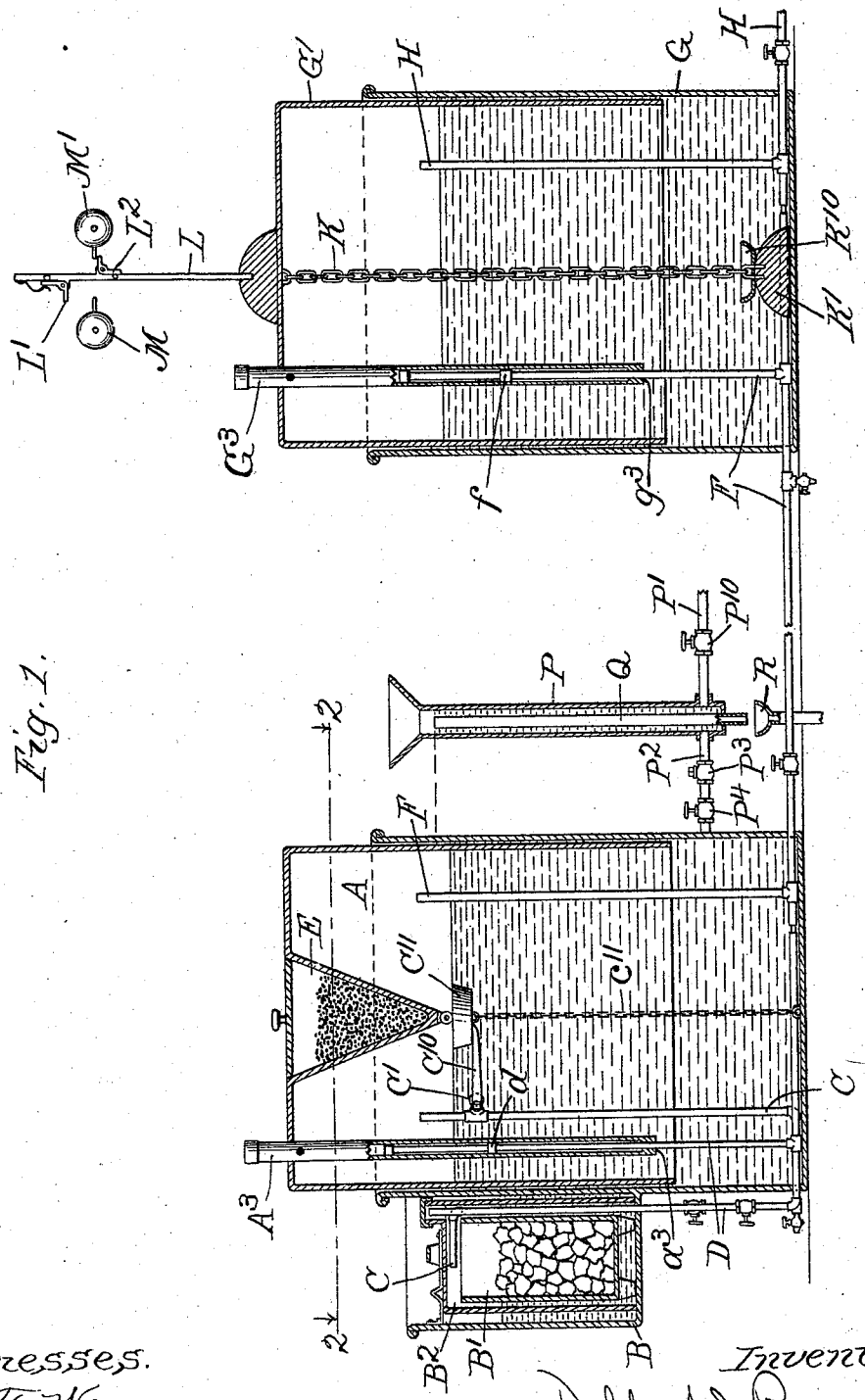

Fig. 1.

Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

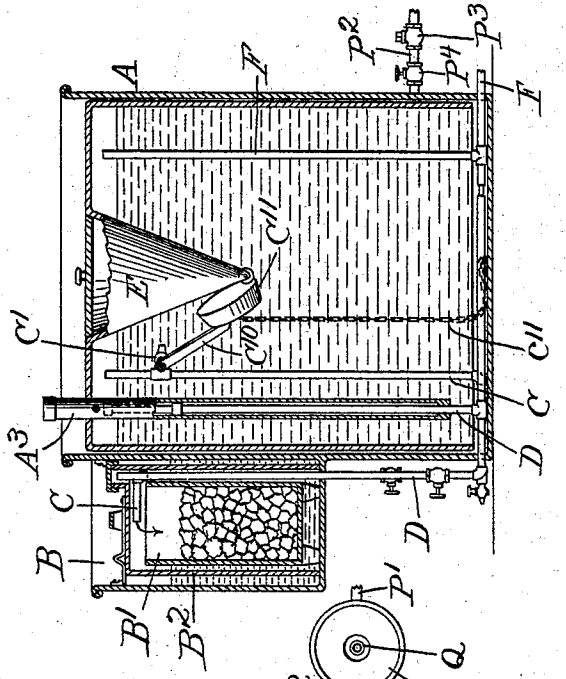
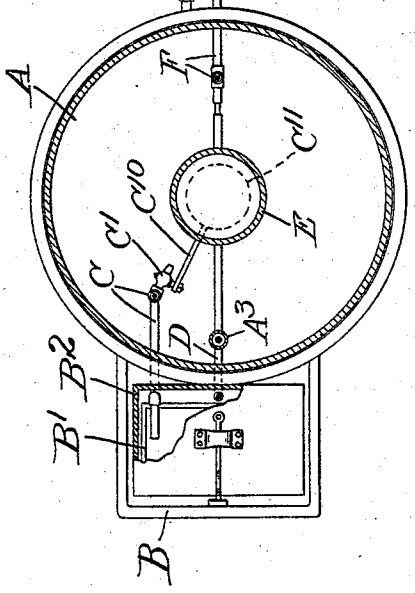


Fig. 2.



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Inventor.
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UNITED STATES PATENT OFFICE.

DELBERT J. REYNOLDS, OF WINNEBAGO CITY, MINNESOTA, ASSIGNOR TO THE FINKLER-REYNOLDS COMPANY, OF CHICAGO, ILLINOIS.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 576,893, dated February 9, 1897.

Application filed October 7, 1896. Serial No. 608,124. (No model.)

To all whom it may concern:

Be it known that I, DELBERT J. REYNOLDS, a citizen of the United States, residing at Winnebago City, county of Faribault, and State of Minnesota, have invented certain new and useful Improvements in Acetylene-Gas Generators, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to render more certain, safe, and reliable the operation of generators for acetylene gas and the receiver in which the same is stored and from which it is supplied for consumption.

It consists, first, in improved means of feeding measured charges of water to the generator at suitable intervals; second, in improved means for flooding the generator with water when one of the elements from which the gas is generated therein is about exhausted; third, in the combination of two receivers or gas-holders, the first of which receives the gas from the generator, while the second receives it from the first and delivers it to the service system and has devices adapting it to be expanded beyond its ordinary condition to accommodate an overflow or excessive supply of gas, and also to permit the first receiver to expand under less than the ordinary operating gas-pressure, in order that it may operate when the generating material is nearly exhausted and generates gas slowly.

It consists, further, in details of construction which are specified in the claims.

In the drawings, Figure 1 is a vertical section axial with respect to both the gas-holders of my improved device, but showing in elevation the parts interior to said gas-holders. Fig. 2 is a section at the plane indicated by the line 2 2 on Fig. 1. Fig. 3 is a vertical section of a primary holder, showing a different position of the parts from Fig. 1.

The gas-holder A comprises the customary pair of cylinders, the upper one inverted into the lower one, the latter being made to contain water to afford a water seal and for other purposes. Mounted upon the outer side of the lower or fixed cylinder is the generator, which comprises the outer box B, interior receptacle B′ for the material from which the gas is to be generated, and cover B^2, inverted over the receptacle and within the box, the latter containing sufficient water to make an effective water seal around the lower end of the inverted cover. A U-shaped pipe D affords communication between the upper portion of the generator and the upper portion of the gas-holder, said pipe extending down through the bottom of the generator and up through the bottom of the gas-holder and standing open above the water in the latter. This pipe is designed to permit the gas to pass from the generator to the gas-holder. There is a second communication between the generator and the gas-holder consisting of the pipe C, which extends up through the bottom of the gas-holder to any convenient point in the water, where it is provided with an inlet-cock C′ below the normal water-level, whose valve-stem has a lever-arm C^{10}, carrying a float C^{11}, which is checked by the chain c^{11} at the position at which the valve is closed, and at such position said float does not protrude above the surface of the water at low-water level. The valve is thus held closed by the float and is opened when the float is depressed. From the bottom of the gas-holder this pipe C extends horizontally across and up into the generator, being provided with a discharge-nozzle or nozzle end adapted to discharge into the receptacle B′, the lower edge of the discharge-mouth being at the low-water level of the gas-holder.

Projecting down from the upper section or dome of the holder A is a conical displacer E, the apex of which overhangs the float C^{11} and encounters said float as the dome descends. This displacer is preferably made hollow upwardly and exteriorly open and adapted to contain sand or like material for weighting the dome to any desired pressure, and the conical form is adopted so that the buoyant effect upon the dome of the intrusion of the displacer into the water shall be counterbalanced by the diminution of the gas area over which the pressure thus diminished is operative, according to a familiar principle, the area of the cross-section of the displacer at the water-level being the amount by which the gas area is diminished on account of the intrusion of the displacer into the water,

while the weight of a volume of water equal to the intruded portion of the displacer is the amount by which the aggregate pressure is diminished. As the dome descends and the conical displacer forces the float C^{11} downward and opens the valve C′ water is admitted to the pipe C, and the amount of water displaced by the intrusion of the conical displacer into the water raising the level passes over through the pipe C into the generator, the normal or low-water level of the gas-holder being the level of the lower edge of the discharge-mouth of the pipe C in the generator, so that without regard to the opening of the valve C′ no water passes except as the water-level is raised in the holder. In operation, the dome descending as the consumption exceeds the supply, a slight intrusion of the displacer into the water, causing a small quantity of water to pass over into the generator, will cause gas to be generated after a brief interval, raising the rate of supply beyond the rate of consumption and causing the dome to rise, withdrawing the displacer from the water and lowering the level and stopping the overflow into the generator. In practice the dome will thus fluctuate with the point of the displacer slightly intruded into the water, the change of level being usually not more than one or two inches unless the rate of consumption is suddenly and widely changed, as by lighting a large number of burners or turning out a large number simultaneously. In such case the change may be wider. When the energy of one of the gas-generating elements in the generator is exhausted or nearly exhausted, so that the charge of water forced thereinto produces no response in the generation of gas or no sufficient response to maintain a supply and prevent the dome from farther descending, such farther descent will intrude the displacer farther and more rapidly into the water, throwing over a large quantity into the generator and flooding the same, driving out all the gas therein and leaving it in condition to be safely opened, cleaned, and charged.

If there is no continuing supply of water to the holder, it will be manifest that the level will be permanently lowered by each displacement and that each descent of the displacer must be a little lower than the preceding in order to raise the water-level to the point of overflow into the generator. In such case the total amount of water thrown over into the generator will be only equal to the volume of the maximum intrusion of the displacer below the overflow-level. This would necessitate supplying water to the gas-holder equal in quantity to the capacity of the generator each time the generator is recharged, and it would also necessitate a relatively large displacer. These disadvantages are avoided by providing means for restoring the water in the gas-holder to the low-water level when the displacer is not intruded—that is, after each instance of intrusion and during the withdrawal of the displacer. Such a device I have shown consisting of a stand-pipe P, outside the gas-holder A, having a water-supply connection P′, controlled by a valve P^{10} and connected by a pipe P^2 with the interior of the gas-holder, a check-valve P^3, and preferably, also, a shut-off valve P^4, being interposed between said stand-pipe and gas-holder. Within the stand-pipe P is an overflow-pipe Q, emerging at the bottom, preferably over a catch-basin or cup R, leading to the drainage system. The top of the overflow-pipe Q is open within the stand-pipe P at the level of the water constituting the water seal between the two cylinders of the gas-holder—that is, at a level adapted to balance the water within the holder subject to the gas-pressure therein when said water stands at the low-water level. The gas-holder may be charged with water either by pouring in at the top of the stand-pipe, which may be provided with a funnel-mouth, as shown, or by admitting water past a valve P′ from any continuous source of supply. From whichever source admitted the water will pass through the pipe P^2 into the gas-holder, the valve P^4 being open and the valve P^3 being adapted to permit the water to pass in that direction, but not to return, and will rise in the gas-holder until it commences to overflow through the pipe Q—that is to say, will rise to the predetermined low-water level in the gas-holder. To prevent even momentary raising of the level in the gas-holder above this predetermined point, the valve P^4 may be set so that the water admitted or poured into the stand-pipe can pass out through the overflow-pipe Q very rapidly relatively to the speed at which it can pass the valve P^4. In order to maintain a constant resupply to make good the displacement of water for the generator, the valve P^{10} may be set slightly open, so as to admit only about the quantity of water needed to thus maintain the water-level of the gas-holder, any slight excess, however, passing out through the overflow-pipe Q, and the attendant, by observing the rate at which the water drips from the end of the overflow-pipe, can easily regulate the supply past the valve P^{10} quite accurately, as required. By this means the supply can never raise the level in the gas-holder above the predetermined low-water level—that is, the level at which it flows over into the generator, but the presence of the check-valve P^3, preventing the water from passing back from the gas-holder toward the stand-pipe and thence into the overflow Q, permits the raising of the water-level by the displacement above described and so permits the feeding of water to the generator, as and for the purpose already stated.

The pipe F, protruding up above the water-level of the gas-holder A and extending thence down and out through the bottom of the holder, passes across horizontally to the holder G and up through the bottom thereof, emer-

ging above the water-level therein, and delivering gas from the holder A into the holder G. The pipe H, protruding up above the water-level of the holder G and extending out through the bottom of said holder, conducts the gas to the service system. The dome G′ of the holder G is weighted to a less amount than the dome of the holder A, but from the under side of the center of said dome G′ a chain K extends to a weight K′, which ordinarily lies on the bottom of the holder G, being attached at the center of a pocket K^{10} at the upper side of said weight. The chain is of such length as to permit the dome G′ to rise without lifting the weight K′ to within a few inches of its upper limit of movement, and when it has thus taken up all the slack of the chain the pressure thus exerted upon the gas contents of the holder G, being the weight of the weighted dome and of the chain less the weight of the water displaced by the chain, is slightly less per square inch of gas-surface in the holder G than that exerted upon the gas in the holder A by its dome A′. From this it results that as the gas passes from the generator first into the holder A and thence into the holder G, both having their domes depressed at the commencement of the entrance of the gas, the dome of the holder G will be lifted first, because it requires less pressure to lift it than to lift the dome A′ on account of so much of the chain as lies slack in the pocket K^{10}, and said holder G will therefore fill to the extent necessary to take up all the slack of the chain and pull on the weight K′ enough to produce a pressure barely exceeding that on the holder A before the holder A will commence to fill, and as the latter fills and gas is withdrawn for consumption it will pass through the holder G without permitting the dome of the latter to fall, thus maintaining a constant reservoir or reserve supply of gas in said holder G, the dome of the holder A rising and falling and periodically causing water to pass over into the generator, as described. When, however, the gas-generating substance in the generator becomes exhausted to such point that the gas generated upon the discharge of water being poured into the generator is insufficient in quantity to supply the consumption, the dome of the holder A will not be lifted, but the dome G′ of the holder G will commence to fall, supplying the deficiency of gas to the service-pipes. From the dome G′ a suitable trip-rod L extends upward and has a trip-dog L′ or other alarm-sounding means which encounter an alarm M after the dome G′ has descended a very short distance, say two or three inches, thereby sounding the alarm and giving notice of the failure of the generator and affording time for replenishing the latter while the gas-supply is maintained in the service-pipes from the contents of the holder G. As the dome G′ descends and deposits the slack chain the pressure which it exerts upon the gas diminishes, and the dome A′ is thereby permitted to descend, as above described, while the float is still submerged, intruding the displacer E deeply into the water and flooding the generator.

The expansion of the holders A and G is limited by suitable check to prevent the lifting of the dome to the top of the water seal. Such check is most conveniently obtained by extending the gas-inlet pipe up within a pipe rigid with the dome and having an aperture or apertures near the top of the dome for the admission of gas to the holder, said exterior pipe having an interior bushing at the lower end and the inserted gas-inlet pipe having a corresponding exterior collar at the upper end, said collar and bushing stopping against each other at the proper point and limiting the expansion of the holder. In the holder A the pipe D has the collar *d* and extends into the pipe A^3, which has the bushing a^3, and in the holder G the pipe F has the collar *f* and extends into the pipe G^3, which has a bushing g^3, operating as described. Whenever from any cause the amount of gas generated exceeds the ordinary capacity of the holder A expanded to the ordinary point—that is, any point short of the absolute limit determined by the check device described, added to that of the holder G when expanded to the point at which all the slack of the chain is taken up—the further generation of gas carries the dome G to the limit determined by the check device and then causes the dome G′ to lift the weight K as said dome rises beyond the ordinary point. The rod L has a second trip-dog L^2, which is adapted to encounter the alarm M′ and cause it to sound as the dome rises beyond the point at which it commences to lift the weight K, so that an alarm will thereby be given indicating that the generation of gas is more rapid than the consumption to an extent that is liable to exceed the capacity of the receivers, and before the limit of the expansion of the receiver G is reached there will be time to draw off the water from the generator and thereby stop the generation of gas and prevent the escape of the same from the receivers, which would occur after both were fully expanded to their limit. The two bells M and M′ being made of different tone, their respective signals may be distinguished.

I claim—

1. In combination, an expansible gas-holder, a gas-generator associated therewith, a gas-duct connecting the upper portions of the generator and gas-holder, and a water-duct leading from the water-space of the gas-holder and discharging into the generator; a displacer which is depressed in the water of the gas-holder by the moving member of the latter as it descends; whereby the descent of said moving member causes the water-level in the holder to be raised and water to pass over into the generator.

2. In combination, an expansible gas-holder and a gas-generator associated therewith, a gas-duct connecting the upper portions of the

gas holder and generator, and a water-duct leading from the water-space of the gas-holder into the generator and having its highest point above the low-water level of the gas-holder; a displacer adapted to be depressed in the water by the descent of the moving member of the gas-holder, and thereby to raise the water-level and cause water to pass over into the generator.

3. In combination, an expansible gas-holder, a gas-generator associated therewith; a gas-duct connecting the upper portions of the generator and holder; a water-duct leading from the water-space of the gas-holder into the generator and adapted to discharge into the latter, its highest point being above the low-water level of the gas-holder; a displacer in the gas-holder adapted to be depressed in the water by the descent of the moving member of the holder; a valve which controls access of water into said water-duct, and means by which the descending member of the gas-holder opens said valve and holds the same open while the water-level is raised by the intrusion of the displacer therein as described.

4. In combination, an expansible gas-holder and a gas-generator connected therewith, a gas-duct connecting the upper portions of said holder and generator; a water-duct leading from the water-space of the holder and discharging into the generator and having its highest point immediately above the low-water level of the gas-holder; a valve which controls access of the water from the gas-holder into said water-duct; a float connected to said valve and adapted to hold the same closed; a water-displacer in the gas-holder, and means by which the moving member of the latter simultaneously depresses said displacer in the water and opens said valve.

5. In combination, a gas-holder and a generator associated therewith; gas and water ducts communicating between the holder and the generator, the highest point in the water-duct being immediately above the low-water level of the holder; a displacer in the holder which is depressed in the water by the descent of the moving member; a stand-pipe communicating with the holder and a check-valve suitably interposed to prevent the flow of water out of the holder toward the stand-pipe; means for supplying water to the stand-pipe, said stand-pipe having an overflow-outlet at a point above the low-water level of the holder a distance corresponding to the gas-pressure to be maintained therein; whereby the water supplied to the stand-pipe maintains the water in the holder up to the low-water level, and cannot raise it above such level and the displacer by intrusion does raise the water above said level.

6. In combination with a gas-generator, a gas-holder into which the gas is caused to pass from the generator; a second gas-holder into which it passes from the first, the second gas-holder having its moving member normally weighted to less pressure than the first gas-holder, and a supplemental resistance to expansion arranged to be encountered by the moving member of the second holder as it rises, whereby when the holder has expanded to a predetermined limit, it becomes restrained to a pressure greater than the first holder.

7. In combination with a gas-generator, a gas-holder which receives the gas generated; a second gas-holder into which the gas passes from the first holder, said second holder having its moving member normally restrained to less pressure than the first and provided with a supplemental yielding resistance to expansion arranged to be encountered when said holder is expanded to a predetermined limit, whereby the second holder is permitted to expand beyond such limit under pressure greater than that to which the first holder is adjusted.

8. In combination with a gas-generator and a gas-holder which receives gas from the generator; a second gas-holder which receives the gas from the first holder, the second holder being normally weighted to less pressure than the first, and provided with a supplemental weight adapted to be picked up as the holder expands, the connection of such supplemental weight being of the nature of a chain adapted to be deposited at its lower end when slackened, whereby the pressure of such holder gradually increases as it expands.

9. In combination with a gas-generator, a gas-holder into which the gas is caused to pass from the generator; a second gas-holder into which it passes from the first, the second holder having its moving member normally weighted to less pressure than the first holder, said weight comprising a chain whose lower end lodges on a fixed support, whereby the chain is deposited and the weight on the holder diminished as the moving member thereof descends, whereby, as the gas is exhausted, the diminishing pressure in the second holder causes the moving member of the first holder to descend to its limit; water connections between the first holder and the generator, and devices in the said first holder whereby the descent to its limit forces water therefrom into the generator to flood the latter.

10. In combination with the gas-generator, a gas-holder into which the gas is caused to pass from the generator; a second gas-holder into which it passes from the first, the second gas-holder having its moving member normally weighted to less pressure than the first holder; a supplemental weight adapted to be encountered or picked up by the moving member of the second holder as it rises, whereby, when said holder has expanded to a predetermined limit, it becomes weighted to a pressure greater than the first holder, whereby it serves as a reserve reservoir for gas; an alarm outside the second holder and connections from the moving member thereof adapted to actuate said alarm as it descends from said predetermined limit.

11. In combination with a gas-generator, a gas-holder into which the gas is caused to pass from the generator; a second gas-holder into which it passes from the first the second gas-holder having its moving member normally weighted with less pressure than the first holder; a supplemental weight adapted to be encountered or picked up by the moving member of the second holder as it rises, whereby when said holder has expanded to a predetermined limit it becomes weighted to a pressure greater than the first holder, said holder being adapted to expand beyond said limit by lifting said weight; an alarm outside said holder, and connections by which the moving member of the latter sounds said alarm as it moves upward carrying said supplemental weight.

12. In combination, an expansible gas-holder and a gas-generator associated therewith; a gas-duct connecting the upper portions of said holder and generator, and a water-duct leading from the water-space of the gas-holder and discharging into the generator; suitable means for maintaining the water in the gas-holder up to a predetermined low-water limit, the highest point in the water-duct leading to the generator being immediately above said low-water limit; a tapering displacer which is depressed point foremost in the water in the gas-holder by the descent of the moving member of the latter, whereby water is slowly and gradually displaced by the entering point of said displacer and caused to pass into the generator, and a larger quantity of water is displaced only by the further descent of said moving member when the discharge of the small quantity fails to cause generation of gas sufficient for consumption.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 2d day of October, 1896.

DELBERT J. REYNOLDS.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.