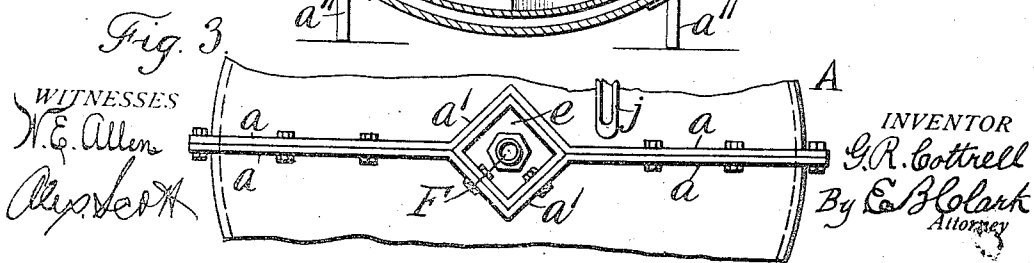
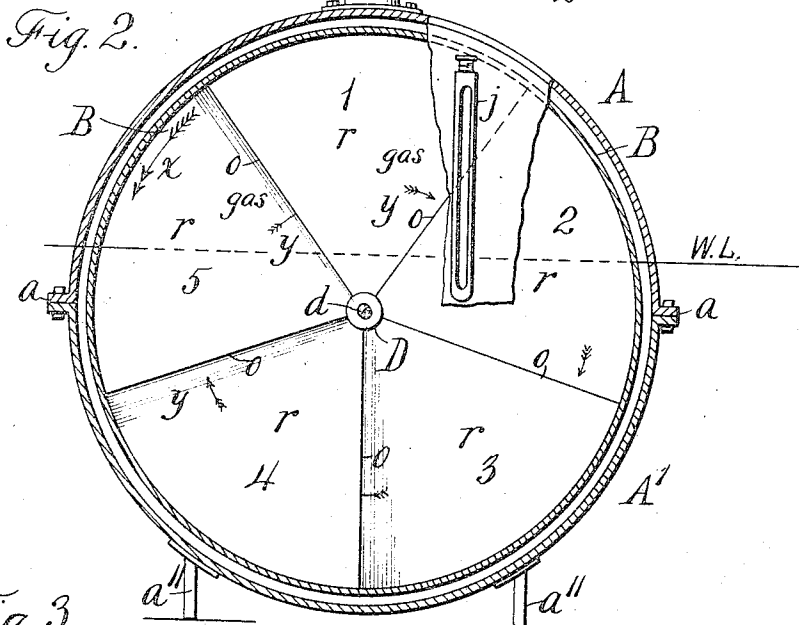
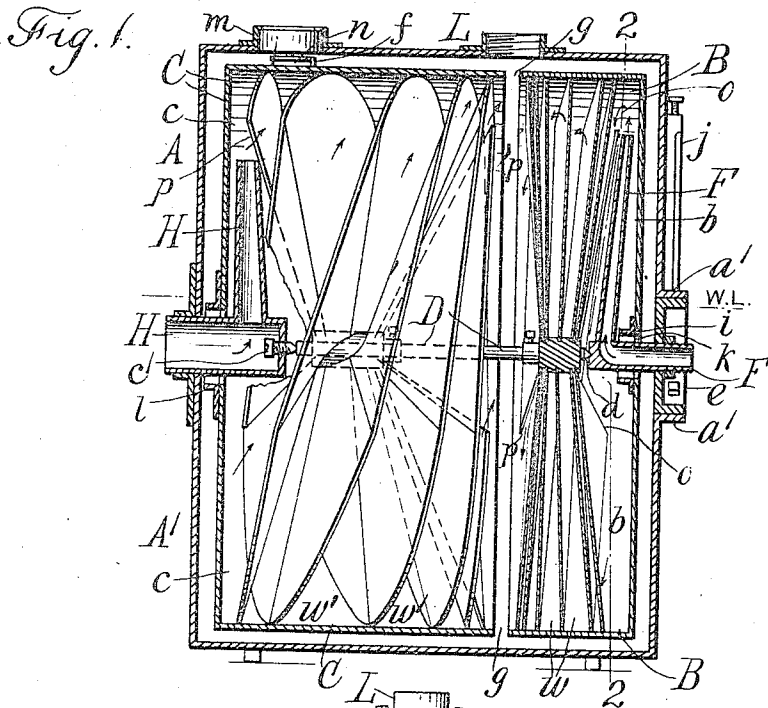


G. R. COTTRELL.
GAS AND AIR MIXING METER.
APPLICATION FILED DEC. 6, 1911.

2 SHEETS—SHEET 1.

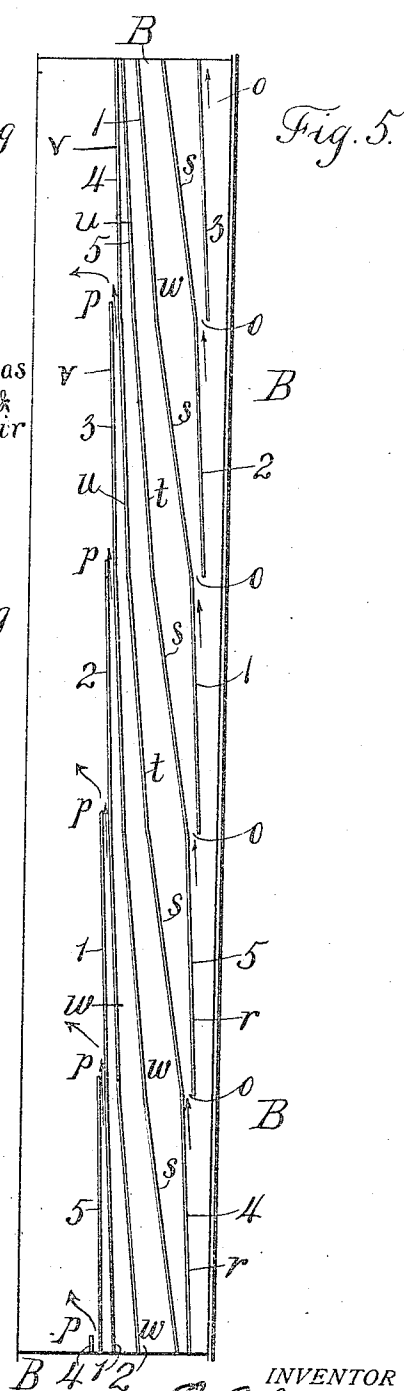
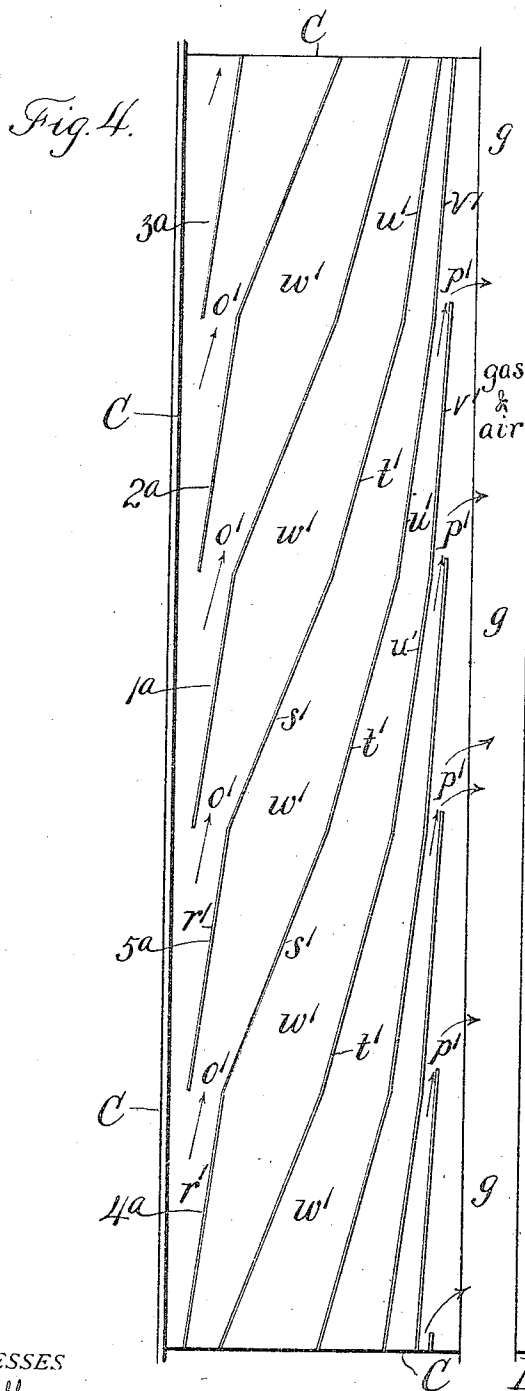


1,042,403.

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2 SHEETS—SHEET 2.



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GEORGE R. COTTRELL, OF ANGLESEA, NEW JERSEY.

GAS AND AIR MIXING METER.

1,042,403.

Specification of Letters Patent.

Patented Oct. 29, 1912.

Application filed December 6, 1911. Serial No. 664,164.

To all whom it may concern:

Be it known that I, GEORGE R. COTTRELL, a citizen of the United States, residing at Anglesea, in the county of Cape May and State of New Jersey, have invented certain new and useful Improvements in Gas and Air Mixing Meters, of which the following is a specification.

This invention relates to gas and air-mixing meters, in which an air-measuring drum is driven or revolved by the pressure of gas passing through, and revolving, a gas-measuring drum, for mixing gas and air in definite and constant proportions, at a uniform velocity and pressure, whereby perfect combustion of the mixture may be produced at the burners.

The object of my invention is to provide a mixing meter in which the screw-measuring compartment of the gas and air drums have diverging walls and are of an increasing cross area from the contracted inlet opening toward the middle portions, and converging walls beyond the middle portions to contracted outlet openings, whereby the currents of inflowing gas in the gas drum will impinge with the greatest pressure and efficiency upon the diverging walls of any two compartments open above the water line, for causing the drum to revolve and thereby cause the air drum to revolve for measuring and mixing gas and air in uniform proportions, velocity, and pressure.

The relative capacities of the measuring compartments of the air and the gas drum in the example illustrated are such that the air drum will take in and discharge approximately five volumes of air while the gas drum takes in and discharges one volume of gas, thereby forming a mixture containing six volumes of combustible fluid. The gas and air, in their respective volumes, are discharged simultaneously at the same velocity into a mixing chamber between the adjacent ends of the drums, so that an intimate mixture is produced, and this mixture is discharged into the outlet pipe under approximately the same pressure as the initial pressure of gas at the intake of the gas drum. The pressure is constantly maintained during the revolution of the drums and while the mixture is flowing to the burners.

The matter constituting my invention herein will be defined in the claims.

I will now describe the details of con-

struction of my improved gas and air mixing apparatus by reference to the accompanying drawings, in which—

Figure 1 represents a vertical longitudinal section through the casing, the drums and the vanes of the gas drum. Fig. 2 represents a vertical transverse section on lines 2—2, Fig. 1, with a part in elevation. Fig. 3 represents a partial end elevation of the outer casing. Fig. 4 represents a diagrammatic view of the air drum showing the screw vanes as though laid out in plan and presenting an edge view, for showing the planes. Fig. 5 represents a similar view of the gas drum with its vanes and planes forming the screw measuring compartments.

The outer cylinder casing is preferably composed of two semi-cylindrical parts A, A', having flanges *a*, by means of which they are bolted together, as indicated in Fig. 3. The parts A, A' may be made of cast metal and will be provided at the ends with angular notches and flanges *a'* for receiving a square boss *e*, which carries the gas inlet elbow pipe F. Both ends of the casing may have this construction. By means of the notches and square boss the parts A, A' may be accurately centered and then the bolt holes drilled in the flanges of both parts. The casing is supported on legs *a''*.

The gas measuring drum B and air measuring drum C are secured to a center shaft D, the end of which at the gas inlet end is provided with a pivot point *d*, while the opposite end is provided with a socket, into which extends the pointed end of a set screw *c'* in the elbow pipe H. The pivot *d* enters a socket in the elbow pipe F. The drums are thus pivotally supported, to turn with the least possible friction. Both of the drums have outer end heads forming respectively the gas chamber *b* and the air chamber *c*. The drums are spaced apart at their adjacent inner ends to form a gas and air mixing chamber *g*, into which streams of gas and air are discharged from the five measuring compartments of each drum. The head of the gas drum B has an inwardly turned tubular extension or collar *i* of larger diameter than the elbow pipe F, so as to leave an annular water seal space *k* around said pipe. This tubular projection *i* and seal *k* prevent gas, which might pass along the head, from escaping into the outer casing. A similar tubular extension *l* may be applied to the head of air drum C, and an

annular water seal thus provided around the elbow pipe H. These passages around the elbow pipes also permit the free circulation of water in the casing as it is displaced by the screw vanes. A discharge pipe L for the mixture of gas and air connects with the top of the casing adjacent to the mixing chamber g. An index dial m, having a star wheel n, is applied to the top of the casing and the star-wheel is engaged by a pin f projecting from the air drum, for indicating the number of cubic feet of mixed gas and air delivered by the mixing meter. A water gage and filling tube j is secured to one end of the casing at an elevation that permits of water being supplied to the interior while the machine is in operation, and maintained at a level about as indicated by the horizontal dotted line in Figs. 1 and 2.

The drums B and C are each provided with five screw-blades or vanes secured to the circumferential wall and to the axle. The peculiar construction, disposition and arrangement of these vanes are all-important, in order to obtain and utilize the full pressure and force of the gas, to turn both drums and deliver without any minimizing of the pressure, a mixture of gas and air in uniform proportions, and both at the same velocity.

The gas drum B is made comparatively short and with narrow measuring compartments w, as compared with the air drum and its measuring compartments, for the reason that it is to measure and deliver only one volume of gas, while the air drum measures and delivers approximately five volumes of air, in the particular mixer which is illustrated in the drawings; but I wish it understood that my invention is not limited to measuring drums having these particular proportions. The relative proportions of the drums will be varied according to the quality or candle power of the gas, and according to the particular work to be done with the mixture. The proportions of one volume of gas to five volumes of air are suited to the ordinary illuminating gas of eighteen to twenty-four candle-power now usually made and distributed in large cities.

The five screw vanes 1, 2, 3, 4, 5, of the gas drum B are spaced to form five measuring compartments w of substantially the same width and capacity, and they overlap each other to form radial inlet openings o and discharge openings p. Each vane encircles, in a helical form, about four fifths of the circumference of the drum, and all the vanes are dished or drawn in close together at the axle where they will, at all times, be immersed in water, and therefore not exposed to the direct gas pressure, as indicated in Fig. 1. This dished shape of the vanes forms a series of radially inclined

planes from the axle outward, against which the inflowing currents of gas impinge at the inlet end, thereby assisting in turning the drum. These particular inclined planes, extending from the axle outward toward the inlet end and the circumferential wall of the drum form only a minor part of the driving surface on which the gas impinges under pressure. Each helical vane is made with five sector shaped planes, r, s, t, u and v, of a different pitch or inclination to the axle, as shown in the diagrammatic views, Figs. 4 and 5. The first series of planes r, Figs. 2 and 5, which overlap the others at the inlet end of the gas drum, require very little pitch as the gas would exert very little pressure upon them in this location, but the second and inclosed series of planes s are given the steepest pitch, so that the gas currents, as soon as they enter the measuring compartments w will impinge with the greatest pressure upon the vane and act to turn the drum. Supposing the gas drum B to be in the position shown in Fig. 2, two of the radial inlet openings or slots o will be above the water line, and currents of gas will enter them as indicated by the arrows y, and will then immediately impinge on the steep-pitch planes s, acting to turn the drum in the direction of the double barbed arrow x. As the drum turns, the inlet end of vane 1 will be carried down into and below the water line, closing its inlet opening o, and the succeeding vanes 2 and 3 will rise out of the water again opening two measuring compartments to the inflowing currents of gas and exposing successive driving planes s to the impinging action of gas pressure currents. The succeeding plane t, though of a less pitch than plane s, will also be impinged upon by the gas under pressure and be effective as a driver when it is above the water line. Since not more than two of the inclined planes, as s and t, in any one vane will be above the water line at any one time, and thus be effective as drivers, the successive planes, as u and v, are given successively a reduced pitch or inclination, whereby they will cut through the water with the least possible resistance. Owing, however, to the fact that the vanes converge at the planes u v, making the compartments of decreasing width, the currents of gas will be driven or forced through them at a maintained pressure to the narrow discharge openings p, where they escape into the mixing chamber g between the drums. The air drum C is also constructed with five helical vanes 1^a, 2^a, 3^a, 4^a and 5^a, dividing it into five measuring compartments w', and each vane is made with five sector shaped planes, as r', s', t', u', and v', of a different pitch and corresponding closely in pitch to the planes in the vanes of gas drum B. Each compartment is provided with a radial

inlet opening o' and a narrower discharge opening p' into the mixing chamber g . Owing to the fact that the measuring compartments in the gas drum and in the air drum are of substantially the same shape and of uniform proportions, one to the other, they will deliver currents of gas and air at the same velocity and pressure, so that they will form an intimate and homogeneous mixture in the exact proportions in chamber g , to cause complete and perfect combustion at the burners. Since all the carbonaceous matter and hydrogen in the gas is consumed by reason of there being present and mixed therewith the necessary proportion of oxygen, a high flame temperature is produced and great economy is effected in the use of gas as fuel.

In the above described construction and as shown in the drawing it will be understood that the screw-measuring compartments of the gas and air drums have contracted inlet and outlet openings, with diverging walls and of an increasing cross area from the inlet openings toward the middle portions, and converging walls beyond the middle portions to the contracted outlet openings, whereby the currents of inflowing gas in the gas drum will impinge with the greatest pressure and efficiency upon the diverging walls of any two compartments open above the water line for causing the drum to revolve.

By constructing the helical vanes of the gas drum of such length that each will encircle approximately four-fifths of the circumference of the drum, every measuring compartment, which at one time is open to the gas chamber at the receiving end, will at the same time be sealed in the water at the discharging end of the drum, so that no gas can pass through when the drum is idle. The measuring compartments of the air drum being sealed in the same manner no gas can pass through them and out through the elbow pipe to the external air. The mixing meter is, therefore, perfectly safe and reliable in use. As soon as the valve in the delivery pipe leading to the burners is closed, the gas and air drums cease to revolve, and the gas as well as the mixture of gas and air present in the casing, is held in place ready for immediate use and ignition when the burner valve is again opened. In practice the measuring drums are made of greater diameter than their length, and the casing is preferably made of a diameter equal approximately to one and half times its length. This feature of construction is important in the gas drum, for the reason that the pressure of gas is more effective on the driving planes in proportion to the radial distance at which it is exerted or applied from the axle or above the water line in the casing.

The operation of the gas and air mixing meter is practically automatic, it being only necessary, after connection to the gas service pipe has been made, to open the valve to the burner, when the gas will flow into the chamber b and thence through openings o into any two measuring compartments w which are open above the water line. The currents of gas now impinge on the driving planes s or diverging walls of the compartment, thereby causing the drum to revolve and discharge gas into the mixing chamber g . The air drum will be simultaneously revolved, causing air to be measured and discharged into mixing chamber g . The successive currents of gas and air at the same velocity are uniformly mixed in chamber g and passed therefrom to the burners.

The mixing meter, as above described and substantially as shown in the drawings, has been constructed and put into practical operation with entirely satisfactory results.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a gas and air-mixing meter, the gas drum mounted on an axle and divided by helical vanes into screw measuring compartments having contracted inlet and outlet openings, and diverging walls, and an increasing cross area from the inlet openings toward the middle portion, and converging walls beyond the middle to the contracted outlet opening, whereby the currents of inflowing gas, under pressure, will impinge with the greatest pressure upon the diverging walls of any two compartments open above the water line and cause the drum to revolve, substantially as described.

2. In a gas and air-mixing meter, the gas drum mounted on an axle and divided by helical vanes into screw-measuring compartments having contracted inlet and outlet openings, the vanes diverging and the compartments increasing in cross area from the inlet openings toward the middle portion, and said vanes converging beyond the middle to the contracted outlet openings, the vanes also having sector-shaped planes of different pitch to the axle, and one or more planes of the steepest pitch being in the diverging portions of the vanes between the inlet and middle portions of each compartment, whereby the currents of inflowing gas will impinge with the greatest pressure upon said planes of steepest pitch in any two compartments open above the water line and cause the drum to revolve, substantially as described.

3. A gas and air-mixing meter comprising a propelling gas drum and an air measuring drum mounted on the same shaft or axle in a casing and having a mixing chamber between them, said drums being constructed with helical vanes dividing them

into screw measuring compartments, the walls of which diverge from the inlet openings toward the middle portion, increasing the cross area, and converge beyond the middle to the contracted outlet openings, whereby the currents of inflowing gas, under pressure, will impinge with the greatest pressure on the diverging walls in the gas drum, thereby revolving the same and the air drum, and whereby the currents of gas and air will be measured in uniform proportions and discharged at the same velocity and pressure into the mixing chamber, substantially as described.

4. In a mixing meter, a drum on an axle in a casing constructed with helical vanes which converge from the circumferential wall toward the axle and which diverge one from the other from the inlet openings toward the middle portion, forming screw measuring compartments of increasing cross area, and which vanes converge beyond the middle to the contracted outlet openings, whereby the currents of inflowing gas, under pressure, will impinge with greatest pressure on the diverging walls or vanes of

any two compartments open above the water line and cause the drum to revolve.

5. In a gas and air-mixing meter, a casing of greater diameter than its length for providing a comparatively tall column of water to prevent leakage of gas and having inlet and outlet openings, a gas drum mounted on an axle in the casing and divided by helical vanes into screw-measuring compartments having contracted inlet and outlet openings and of increasing cross area from the inlet openings toward the middle portions and of decreasing cross area beyond the middle to the outlet openings, whereby the currents of inflowing gas, under pressure, will impinge with the greatest pressure upon the diverging walls of any two compartments open above the water line and cause the drum to revolve, substantially as described.

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

GEORGE R. COTTRELL.

Witnesses:

JAMES McLINDEN,
F. M. TOPPIN.