

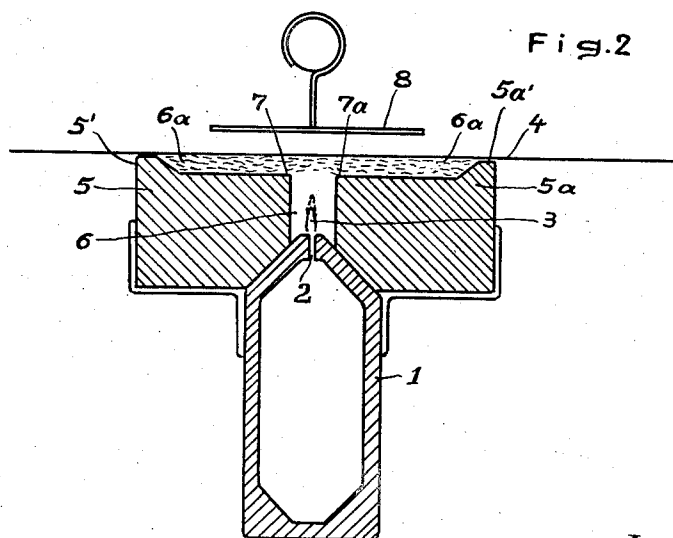
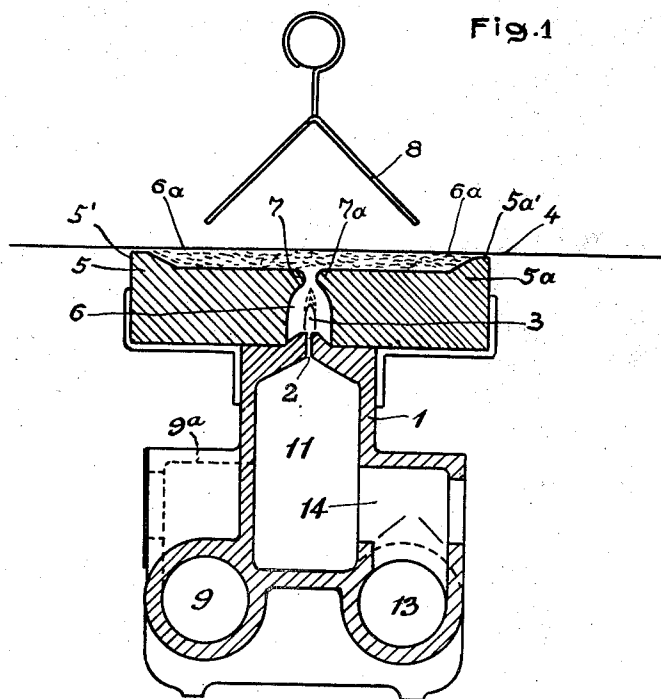
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METHOD OF AND APPARATUS FOR SINGEING TEXTILE FABRICS

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METHOD OF AND APPARATUS FOR SINGEING TEXTILE FABRICS

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In order to increase the economy of singeing burners the applicant has already proposed, in his prior patent specifications, mixing the gaseous or vaporous combustible before it emerges from the mouth of the burner with approximately the total quantity of air necessary for combustion, so that the combustible mixture lies closely below the explosive limit. In this way a sharp, non-luminous (blue) jet of flame is obtained even in the combustion of gasified or vapourized heavy oil and considerable progress is made in the economical working of the singeing process.

By means of the present invention this progress has now been considerably advanced, inasmuch as, according to the present invention, not only is the total quantity of oxygen necessary for combustion supplied to the combustible before the formation of the flame but a considerable excess of oxygen is supplied in addition with the primary air, which excess of oxygen is heated to a high temperature in the flame itself and combines actively with the textile fibres to be singed and effects their combustion likewise in the form of a blue or completely invisible Bunsen flame.

In consequence of the extra-ordinarily large admixture of primary air or oxygen the combustion of the gaseous or vaporous fuel supplied takes place with a quite surprisingly small flame. Preferably, therefore, the corresponding combustion chamber is reduced in size to a hitherto unusual extent, so that the walls of the combustion chamber approach close to the mouth of the burner on both sides. The combustion of the fuel supplied therefore takes place in an exceedingly small space, and this reduction in the size of the combustion chamber at the same time affords the possibility of using the glowing surface of the walls for igniting the combustible. Owing to the great excess of air the combustible is no longer capable of igniting in an open

flame and supporting the combustion. At the same time a strong concentration of heat takes place in this small combustion chamber, while radiation losses on the other hand become extraordinarily small.

Adjacent to this narrow combustion chamber for the combustible which is supplied to it there is then a second combustion chamber which is several times wider in which the strongly heated excess of oxygen combines with the fibres of the fabric to be singed in the form of blue or invisible jets of flame and burns them. This second chamber is open on top but is covered at this part by the fabric to be singed and is preferably provided at the transitional place between the two chambers with a constriction, of which the highly heated edges serve the purpose of igniting the gas-impooverished combustible mixture and thereby exert a favourable influence towards supporting the primary (combustible-) flame.

As has been confirmed by experiment, success has been achieved by means of the new method or by the new apparatus in making the heat of combustion of the fibres themselves of the fabric to be singed utilizable to a large extent for the singeing process, and in obtaining thereby an economy in fuel used which is on the average about 50% of that of the former process. Also the singeing effect itself is at the same time considerably improved.

Two constructional examples of the invention are illustrated in the accompanying drawings, in which

Fig. 1 is a cross-section through a preferred form of the new burner, and

Fig. 2 a cross-section through a burner of a type generally usual which by the addition of suitably shaped bricks is converted into a burner in accordance with the invention.

In the example illustrated in Fig. 1, 1 is the known high-efficiency singeing burner in accordance with the prior specifications of

the present applicant, 2 is the slit in the burner, 3 is the gas flame, 5 and 5^a are fire-resisting bodies which are arranged on either side of the flame and form an extremely small combustion chamber 6 and 6^a between them, in which the combustion of the gaseous mixture takes place.

The mixing of the gaseous or vaporous fuel with air takes place outside of the burner in a separate mixing apparatus, as has been described in applicant's Patent No. 1,532,260. Housing 1 of the burner is several meters long. Attached to one of the longitudinal side walls of the housing of the burner is a tube 9 through which enters the mixture of fuel and air, whereupon it passes through an opening 9^a, provided in the middle of the burner housing, into storing chamber 11. Arranged at the opposite longitudinal side of the burner housing is a second tube 13, into which enters the compressed air. Tube 13 is, at both ends of the burner housing, connected with storing chamber 11 by means of square opening 14. The compressed air passing through tube 13 enters the burner housing at both of its ends and serves to regulate the width of the flame, as described in Patent No. 1,532,260. The compressed air for regulating the width of the flame is, however, of minor importance in this case. According to the present invention, a large quantity of excess air is admixed already to the fuel before it enters tube 9, i. e. outside of the burner, whereupon this mixture of fuel and air passes into chamber 11 and from there through slot 2 into chamber 6, where the combustion takes place. Because of the extraordinary large admixture of primary air this combustion is effected in a very small space, the ignition occurring at the incandescent walls of the combustion chamber and being permanently maintained in an explosion-like manner. This action is in addition considerably assisted by the projections 7 and 7^a on the fire-resisting bodies 5 and 5^a which become incandescent after a few seconds burning and then act in known manner as catalyzers so as to maintain even the combustion of vapourized oils. The upper surface of the fire-resisting bodies 5, 5^a is also provided at the outer edge with an upwardly projecting rib 5' and 5^{a'} respectively, which extends close up to the path 4 of the fabric to be singed. A second considerably wider combustion chamber 6^a is thereby formed, which chamber is connected by way of the gap between the projections 7, 7^a with the lower combustion chamber 6. Both chambers act together as follows.

The combustion of the heating mixture takes place in the lower combustion chamber 6 from the mouth of the burner to the projections or edges 7, 7^a, and this combustion which is in the form of a small, sharp flame 3 is so limited that the combustion is actually com-

pletely effected below the projections or edges 7, 7^a. When the fabric 4 has not yet been placed over this burner, no flame or flame-like form at all can be noticed above the projections or edges 7, 7^a, only the escape of the hot gases of combustion can be determined owing to the high temperature. Only when a fabric 4 has been placed on it and is singed does the upper part of the burner chamber, designated by 6^a, above the edges or projections 7, 7^a up to the fabric 4 come into operation as combustion chamber for the fibres of the fabric to be singed.

Owing to the shape of the fire-resisting bodies 5, 5^a a combustion chamber having two divisions 6 and 6^a is then formed. The heat radiated by the closely adjacent walls of the fire-resisting and badly conducting bodies 5 and 5^a accumulates in the lower combustion chamber 6 for the heating mixture and radiation losses are reduced to an extremely small amount owing particularly to the small dimensions of the combustion chamber. A similar action occurs in the upper part of the combustion chamber 6^a, where the heat of combustion of the fibres of the fabric, which otherwise is lost in the atmospheric air at its lower surfaces, is in part accumulated by the walls of the closely adjacent fire-resisting and badly heat-conducting bodies 5 and 5^a and in part usefully radiated back to the fabric.

Above the fabric 4 and at a short distance from it there is also provided a covering hood 8, the object of which is to enable the singeing flame 3 to ignite when the fabric 4 is not travelling over it, since a small quantity of gas collects under the hood 8 and ensures that the singeing flame 3 ignites and continues to burn, owing to the hood 8 becoming incandescent, at those times and at those parts of the burner where the fabric 4 does not travel, for example, when the fabric which is being singed is of less width than the burner.

The combustible mixture is so adjusted, for obtaining a first-class singeing effect, that the actual flame 3, in spite of the high efficiency obtained by the new singeing burner, is quite unusually small and invisible. If the fire-resisting bodies 5 and 5^a are removed it is not possible to cause the combustible mixture, after having been correctly adjusted for singeing, to ignite owing to the composition of the mixture. On holding a burning faggot in the escaping combustible mixture a quite small blue whirl of flame can scarcely be noticed. This circumstance i. e. the extremely large addition of air for combustion, is an essential characteristic of the new process. The smallness of the dimensions of the burner which the invention makes it possible to employ will be seen from the following figures. In a burner according to Fig. 1 which gave good results the slit 2 in the burner had

a width of 1 m. m., the width of the burner chamber 6 amounted to only 20 m. m., and the distance between the projections 7, 7^a was 10 m. m., while the upper combustion chamber 6^a was 40 m. m. in height.

Fig. 2 illustrates the employment of the fundamentals of the new invention and the fitting of the burner chamber 6 to ordinary gas flame singeing burners such as have been employed for about the last 50 years on almost all so-called gas flame singeing burners. In this case there are simply placed on the burner the shaped fire-resisting stones 5, 5^a, which owing to their special shape form the two combustion chambers 6 and 6^a. The edges 7, 7^a, in contra-distinction to the form illustrated in Fig. 1, are not shaped so that they project inwardly because a constriction at the place of transition is not absolutely necessary. Further the cover plate 8 is flat and arranged nearer to the fabric. As will easily be seen, the singeing burners hitherto employed can easily be converted for the new method.

As has hereinbefore been explained, in accordance with the present invention, the combustible mixture employed operates with a very considerable excess of oxygen in the primary flame. This excess of oxygen is heated by the incandescent walls of the combustion chamber 6 to the high temperature of the superheating produced by the accumulation of the heat and serves the purpose of causing the fabric to be singed to be used as a means for producing gas for carrying out the singeing process in pure blue jets of flame or flameless combustion, to a desired extent according to the singeing effect to be produced. The amount of the excess of oxygen which is not consumed by the gas flame varies of course according to the weight and thickness and thereby with the amount of the fibres to be singed within fairly wide limits.

Consequently in the new process the amount of air present in the combustible mixture must be measured and regulated so as to correspond as exactly as possible to the practical requirements, otherwise if the supply of oxygen is too little a slow burning of the flame occurs and the singeing effect is bad whereas if the excess of oxygen is too great the flame goes out.

Whereas the limits of inaccuracy in the measurement of the quantity of air to gaseous fuel might be fairly considerable in singeing burners of the old construction without endangering the final result of obtaining a moderately useful singeing effect, it is necessary with the new burner to keep the errors or excess quantities of atmospheric air, i. e. of oxygen, within the narrowest limits.

The necessary regulability of the combustible mixture is however ensured by employing the so-called universal regulator according to the German Patents No. 328393 and No.

328999 of the present applicant, so that there is no difficulty in singeing by the new process both the finest fabrics such as zephyr, muslin and voile on the one hand as well as satins, heavy drills and velveteen on the other hand.

Exact experiments on the calorific value of the fibres to be singed and their participation in the singeing process have given the following results:

There were singed 1000 metres of satin 85 cms. wide, cotton.

Adjustment 36/18-36/42.

Weight of fabric to be singed in a completely dry condition 112 kg.

Weight lost in singeing 1.6 kg.

Therefore 1.6 kg. of cotton fibres were singed from 1000 metres of satin.

The cotton has a calorific value in an almost completely water free condition of about 4000 calories per kg.

This gives for 1.6 kg. of singed cotton fibres a calorific value of 6400 calories for 1000 metre length of satin 85 cms. wide.

For singeing with the new singeing burner in accordance with the invention 2.1 cubic metres of illuminating gas having a calorific value of about 4500 calories per cubic metre were required for 1000 metres of fabric of the kind stated above. This is a total of 9450 calories. These 9450 calories were used in the form of gas for singeing the fabric. In addition there are 6400 calories, the calorific value of the singed off and burnt cotton fibres, which gives a total calorific value of 15850 calories.

It is not difficult to recognize even from this numerical example that, according to the new invention, for 1000 metres of satin of the kind mentioned, that amount of air must first be added to the illuminating gas which is necessary for the complete combustion in a closed combustion chamber of the 9500 calories of illuminating gas which is employed, secondly however an excess of air or oxygen must also be present which is sufficient to burn these 6400 calories of cotton fibres which are singed off per 1000 metres of fabric either in pure blue jets of flame or flamelessly.

Further to this numerical result, attention must also be called to the fact that the loss in singeing heavy fabrics with thick fluff may amount to 5 kg. and over per 1000 metre length, and these 5 kg. of singed cotton fibres have a calorific value of about 20,000 calories, and these also must be consumed by the excess of oxygen contained in the fire gases in order to ensure success in accordance with the invention.

This shows the wide limits within which the composition of a gas-air mixture must be capable of being regulated in order to ensure the success of the new invention with every kind of fabric to be singed, for example, using illuminating gas having a calorific value of about 4500 calories per cubic

metre a combustible mixture may be employed which consists of 85-95% atmospheric air and only about 15-5% illuminating gas, so that this mixture, when it flows freely out of the burner, in accordance with Fig. 1 of the drawing, can by no means be ignited because it is much too impoverished in gas for the ordinary combustion process in free atmospheric air. This extremely impoverished gas-air mixture is however absolutely essential for obtaining success.

On the other hand these experiments also show that, of the total amount of heat necessary for singeing a fabric, 30-60% of the required calorific value is made available from the fibres to be singed if the new singeing process is correctly employed, and an economy in the singeing process which was hitherto absolutely unknown is obtained.

The invention is of course not limited to the constructional example illustrated but other forms of construction are possible. In particular the combustion can be used in combination with gases ready mixed and also with apparatus with which the gas or the vapourized fuel is first produced in the singeing machine itself. Further in addition to or instead of atmospheric air in some cases pure oxygen may be supplied for combustion.

I claim:—

1. Method of singeing textile fabric with gaseous or vapourous fuel according to which a rich excess of oxygen is supplied to the fuel with the primary air before the formation of flame and the ignition of the flame is effected on glowing or incandescent walls after which a combustion of the textile fibres to be singed with non-luminous flame is effected by the excess oxygen which is heated to a high temperature in the flame.

2. Apparatus for singeing fabric, including a gas burner, a combustion chamber surrounding said burner, a second combustion chamber in communication with the first, means for supplying to said burner a combustible gas, and a supply of combustion supporting gas with the latter in excess of the amount needed to support combustion of the former, said first named combustion chamber being constructed and arranged with respect to said gas burner to be heated to incandescence thereby and said second named combustion chamber being constructed and arranged to substantially confine gases communicated thereto to the surface of the fabric being singed.

3. Apparatus for singeing fabric, substantially as described in claim 2, and the theresaidd second named combustion chamber having upwardly projecting edges over which the fabric is passed in singeing operation.

4. Apparatus for singeing fabric, substantially as described in claim 2, and the theresaidd first named combustion chamber having one or more ports communicating with

the theresaidd second named combustion chamber, said ports being provided with inwardly extending projections.

5. Apparatus for singeing fabric, substantially as described in claim 2, and having a gas restraining member positioned over the theresaidd second named combustion chamber, said member being constructed of refractory material.

In testimony whereof I affix my signature.
WALTER OSTHOFF.

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