Aug. 16, 1932. C. J. COBERLY 1,872,410

METHOD OF CONTROLLING SCALE IN GAS CUTTING OF METALS

Filed April 15, 1930

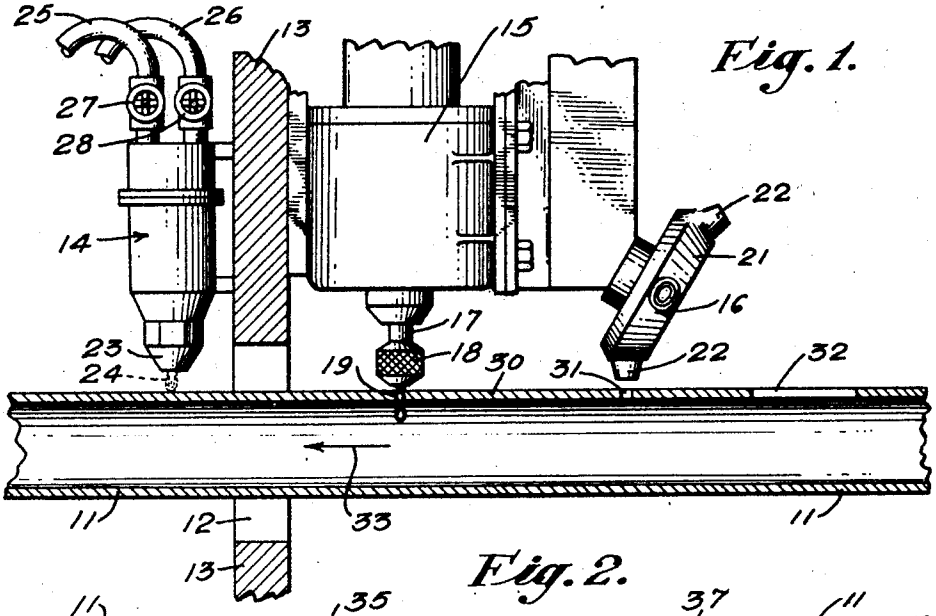


Fig. 1.

Fig. 2.

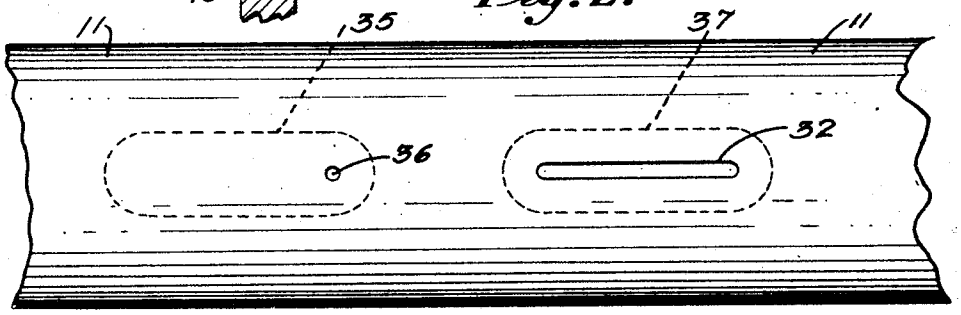


Fig. 3.

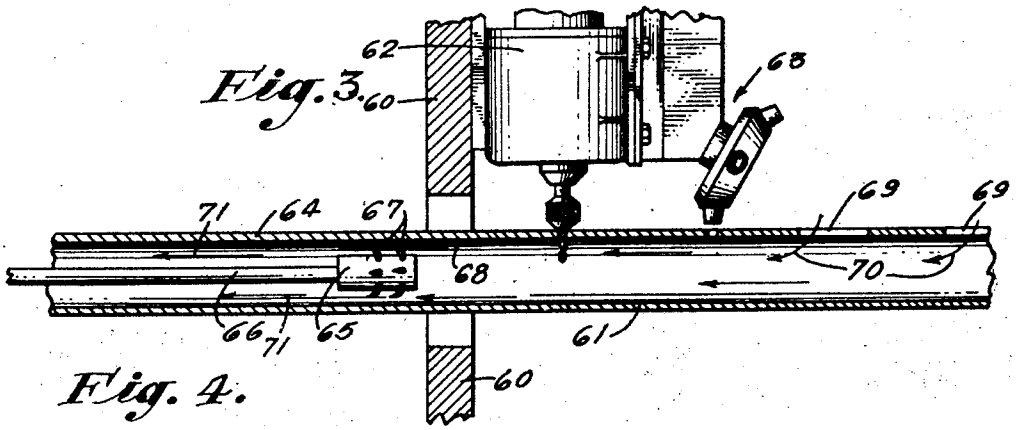
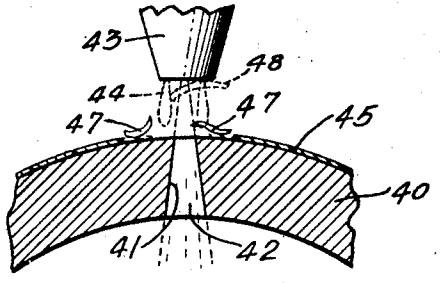


Fig. 4.



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UNITED STATES PATENT OFFICE

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METHOD OF CONTROLLING SCALE IN GAS CUTTING OF METALS

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My invention relates to the art of gas cutting metals which is extensively employed in the cutting of slots in ferrous metals and relates particularly to a method and apparatus for preventing the presence of scale from interfering with the cutting operation.

The present utility of my invention is in cutting of slots in pipe or seamless tubing for the purpose of making strainers or screen for wells; therefore, in order to simplify the disclosure of my invention without limiting the scope thereof, I shall hereinafter describe the invention relative to the gas cutting of slots in ferrous metal pipes and tubes, it being understood that the precepts of the invention may be applied to the cutting of slots in various metal plates and bodies.

It is found that the presence of oxides or scale on the surface of metal will interfere with the action of a jet of cutting gas which in practice is generally oxygen. This interference with the cutting action is especially important in the cutting of slots in pipe for the purpose of making a well screen or strainer and in the previous practice it has been customary to remove the oxides or scale from the surface of the pipe so as to leave the area adjacent to the line along which the cut is to be made absolutely clean in order to prevent interference with the cutting of the slots due to the presence of scale.

My present invention comprehends a method whereby the cutting operation may be conducted in the presence of scale therefore eliminating the necessity of removing the scale from the pipe, and accordingly reducing the cost of cutting.

There are a number of reasons which may be ascribed to the interference of gas cutting of metals due to the presence of scale, among which are the containing of moisture in the scale either in the form of hydrated oxide or water mechanically held in the pores of the scale, and the difference in expansion and contraction of the scale and the metal on which such scale is formed.

Naturally, the high heat produced by the cutting torch or tip causes volatilization of the moisture content of the scale more rapidly than such a volatilized moisture can escape from the pores of the scale, thereby causing the scale to disintegrate and fly off from the surface of the supporting metal in the form of flakes. These flakes are often thrown directly against the torch in such a manner that the heating flames thereof, or the oxygen jet, or jets, are cut off intermittently, causing the torch to back-fire. In other instances the flying portions of scale being incandescent will adhere to the cutting torch, making it necessary to clean the face of the torch so as to uncover the flame and gas openings thereof before the torch can again be used. In addition to the presence of moisture in the scale, the rapid application of heat is found to cause disintegration of the scale and the breaking off of scale particles from the supporting body of metal.

An object of my invention is to provide a method and apparatus for controlling scale in the presence of a gas cutting operation by heating the scale in the zone surrounding the line along which a gas cut is to be conducted for the purpose of conditioning the scale to avoid the disintegration thereof and the corresponding unsatisfactory results, when the cutting torch is applied for the purpose of making a cut in the supporting metal.

The principal utility of this preliminary heating operation is to drive from the scale content the moisture, which may be hydrated oxide or moisture mechanically carried by the scale.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawing which is for illustrative purposes only,

Fig. 1 is a vertically sectioned fragmentary view of diagrammatic character showing an apparatus suitable for practice of my present invention.

Fig. 2 is a view showing a surface of a metal body, such as a pipe, which has been gas cut in the presence of surface scale and in accordance with my present invention.

Fig. 3 is a vertically sectioned view similar to Fig. 1 but to reduced scale, showing an alternative form of apparatus by which the invention may be practiced.

Fig. 4 is an enlarged fragmentary partly sectioned view showing the conditions encountered in the making of a cut in a metal body having a coating of oxide, or scale thereon.

In Fig. 1, I show a pipe 11 extending through an opening 12 in a support 13 which carries a preliminary heating torch 14, a drill motor 15 and a cutting torch 16.

In accordance with the art of slotting pipe disclosed in my United States Letters Patent No. 1,666,166, granted April 17, 1928, the mechanism shown in Fig. 1 is capable of first drilling small holes in the pipe, after which these small holes are used as the starting points for gas cut slots. As such practice is now known to the art, it is unnecessary to herein explain in detail the features and advantages encountered in the combined use of the drilling and cutting mechanism generally indicated at 15 and 16.

The drill motor 15 has a vertically movable spindle 17, equipped with a chuck 18 whereby to hold the small drill 19, which is preferably of high speed steel, so that it may be readily employed to drill heated metals. The torch 16 has a rotatable head 21, carrying a plurality of tips 22 so that in event one of the tips 22 should fail to properly function the head 21 may be rotated to bring another tip into working position. The preliminary heating torch is equipped with a tip 23 from which a flame 24 issues. The fuel employed to produce the flame 24 may be acetylene properly mixed with oxygen, or may be common hydrocarbon gas intermixed with air. In Fig. 1, however, I have shown flexible conduits 25 and 26 leading into the torch 14 through valves 27 and 28 for the purpose of conducting the proper gaseous substances to the torch. The cutting torch, in accordance with this practice, receives acetylene gas and oxygen through flexible conductors or tubes similar to those shown at 25 and 26.

In Fig. 1 the drill 19 is shown during the operation of penetrating the wall 30 of the pipe 11 and in alignment with the tip 22 of the torch 16 a drill hole is shown. To the right of the drill hole 31, a slot 32 which has been previously cut is shown.

In accordance with the convenient use of the cutting equipment the structure 13 is adapted to move intermittently in the leftward direction, indicated by arrow 33, such movement being properly timed with the operation of the drilling mechanism and the cutting torch 16. During the drilling operation the heating flames issue from the torch 16 so as to heat the metal surrounding the hole 31 and when the drill spindle 17 is raised a cutting jet of oxygen is directed through the hole 31, whereupon the head 13 is moved in leftward direction causing the jet which issues from the tip 22 of the torch 16 to cut a slot in the wall 30 of the pipe 11. During the heating of the area surrounding the hole 31 by flames issuing from the cutting torch tip 22, the flame 24 may issue from the torch 14 so as to play on the surface of the pipe 11, or rather on the scale or oxide coating of the pipe. The flame 24 is continued throughout the time of the travel of the support 13 in leftward direction so that an elongated area 35 on the pipe is heated, this heated area being so positioned that the next hole formed by operation of the drill 19 will be situated at the rightward end thereof, as indicated at 36 of Fig. 2.

After the hole has been drilled at 36 therein the heated area 35 is relatively moved into position of cooperation with the cutting torch 16 so that when the cutting torch is again operated a slot 32 will be cut centrally along the heated area which then occupies the relative position indicated at 37 in Fig. 2.

From the foregoing it will be perceived that before the cutting torch 16 is operated to cut a slot in the pipe 11 a zone is heated surrounding the line along which the cut is to be made, the heating of this zone being effective to greatly reduce or to entirely prevent disintegration of the oxide or scale coating of the pipe during the operation of the cutting torch 16, thereby avoiding the difficulties heretofore encountered in the cutting of pipe having scale thereon and which difficulties made necessary the cleaning of the pipe.

In Fig. 4 I show a portion of the pipe wall 40 in which a slot 41 is being cut by a gas jet 42 delivered from a cutting torch 43 which in addition to the jet 42 provides heating flames 44. The pipe 40 is shown with its customary coating of oxide or scale 45. The heat produced by the heating flames 44 and by the cutting action of the jet 42 causes flakes 47 to break, curl up, or fly off from the oxide coating or scale 45 on the pipe 40. As indicated by dotted lines 48 in Fig. 4 a flake of scale is often carried against the lower end of the torch 43 with the result of either causing the torch to back-fire or shutting off the proper issue of the heating flames, or the cutting jet.

My invention substantially eliminates such conditions as those just described by conditioning the scale in the zone surrounding the line of cut so that flying of scale will not occur during the time and as the result of the application of the cutting torch to the pipe. The flame 24 of the torch 14 accomplishes a preliminary heating of the scale which results in dehydrating the scale and also producing in the zone of the line of cut disintegration or flaking of the scale either as the result of volatilization of moisture therein, or the expansion, or internal stresses set up in the scale due to the application of heat thereto. This conditioning or preliminary heating of the scale is accomplished before

the zone of the line of cut is operated on by the flames and gas issuing from the cutting torch.

In the preferred practice of the invention the scale and the pipe adjacent thereto are heated to a temperature of from 250° F. to 350° F., which is above the boiling point of water, such temperature accomplishing the desired effect of dehydrating the scale, conditioning same for the cutting operation.

In Fig. 3 I show an alternative form in which the invention may be practiced, including a frame 60 relatively movable to a pipe 61, a drilling mechanism 62, and a torch 63 mounted thereon. Into the forward end 64 of the pipe 61 a burner head 65 is projected on the end of a pipe 66 through which gas or a fuel mixture is conducted to the burner head 65. The burner head is at all times maintained in a position ahead of the torch 63 and its flames 67 are directed radially outwardly against the wall 68 of the pipe 61 so as to heat the pipe and likewise the scale or oxide coating carried thereon preliminary to the cutting operation to be accomplished by the cutting torch 63.

During the operation of the device shown in Fig. 3 a circulation of air is maintained in leftward direction through the pipe 61 by a suitable exhaust fan located at the left end thereof, the air entering the pipe through the last few rows of slots 69 which have been previously cut, as indicated by arrows 70 and flowing leftwardly through the pipe 61 and around the burner head 65 as indicated by arrows 71.

The mechanism disclosed in Fig. 1 heats only limited areas or zones of the scale and pipe surrounding the line of cut to be followed by the cutting torch and the form of mechanism shown in Fig. 3 heats the entire wall of the pipe, this latter practice requiring a larger amount of heating but in a measure compensating therefor by the use of a very cheap fuel in the burner head 65.

Although I have shown a simple and practical embodiment of my invention it is recognized that some of the elements thereof may be replaced by other elements capable of performing the same functions in a substantially equivalent manner; therefore the invention is not to be limited by the details of the foregoing disclosure but should be accorded the full scope of the following claims.

I claim as my invention:

1. A method of controlling scale in gas cutting of metals having scale thereon, comprising heating the scale in the zone of the cut to be made to a temperature between 250° F. and 350° F. preliminary to application of the cutting torch to make such cut and at a time sufficiently ahead of said cut to permit complete conditioning of said scale against disruptive action of the scale in the presence of the cutting plane.

2. A method of controlling scale in gas cutting of metals having scale thereon, comprising the application of an initial heating flame in a manner to heat the scale in the zone of the cut to be made to a temperature between 250° F. and 350° F. preliminary to application of the cutting torch to make such cut and at a time sufficiently ahead of said cut to permit complete conditioning of said scale against disruptive action of the scale in the presence of the cutting flame.

3. A method of the character described for cutting a slot in a metal wall, including: heating the metal in the zone of the slot to a temperature between 250° and 350° F.; drilling a starting hole in said wall in said heated zone; and, by use of a jet of cutting gas, cutting a slot starting at said hole and extending within said heated zone.

4. A method of the character described for cutting a slot in a metal wall, including: heating the metal wall to a temperature between 250° and 350° F.; drilling a starting hole in said metal wall; heating the metal surrounding said hole to a temperature for producing combustion of the metal in the presence of a cutting gas; and, by the use of a jet of cutting gas, cutting a slot in said wall starting at said hole.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 10th day of April, 1930.

CLARENCE J. COBERLY.