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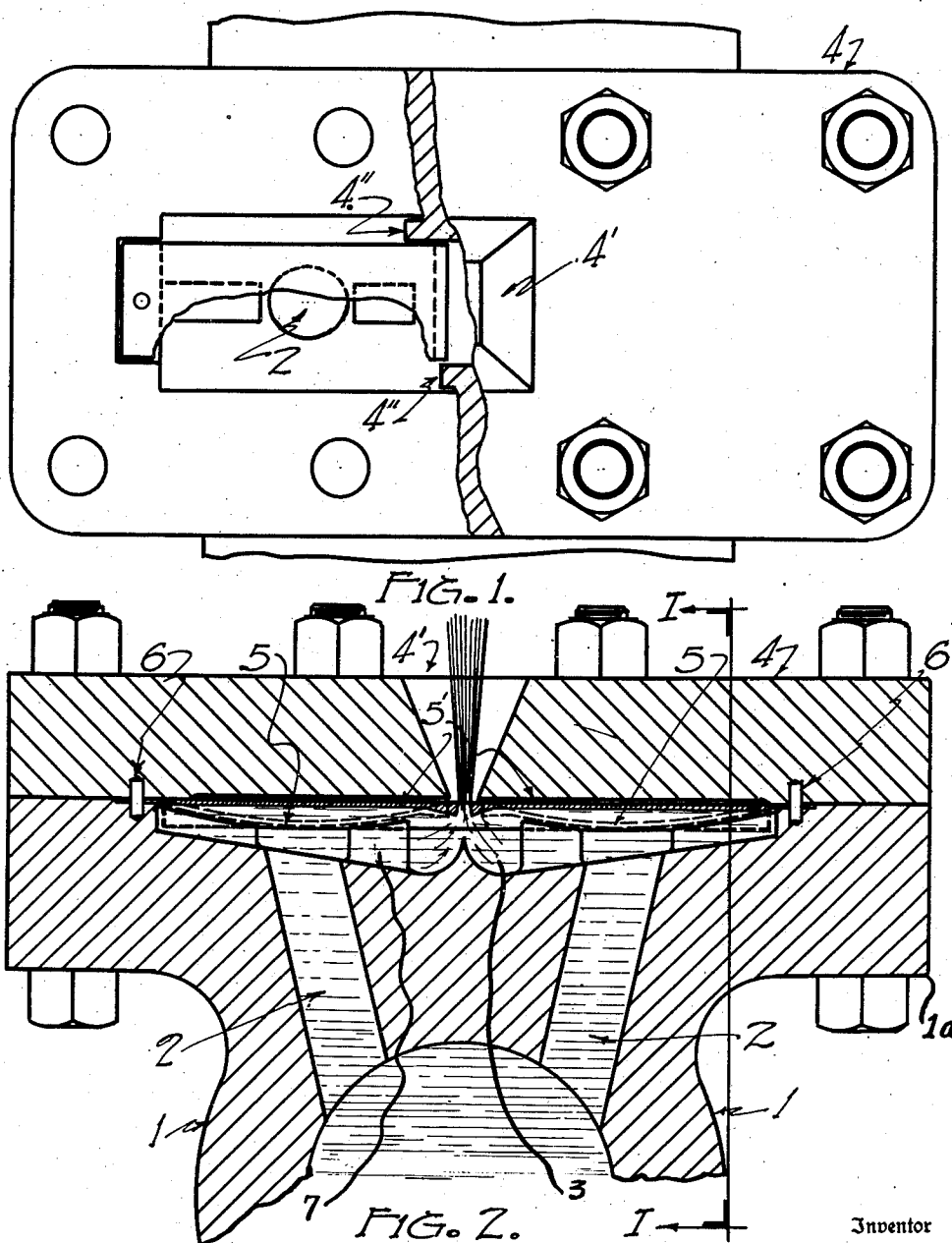
E. B. HUDSON

2,188,354

SELF-CLEANING HYDRAULIC SPRAY DEVICE

Filed June 30, 1938

2 Sheets-Sheet 1



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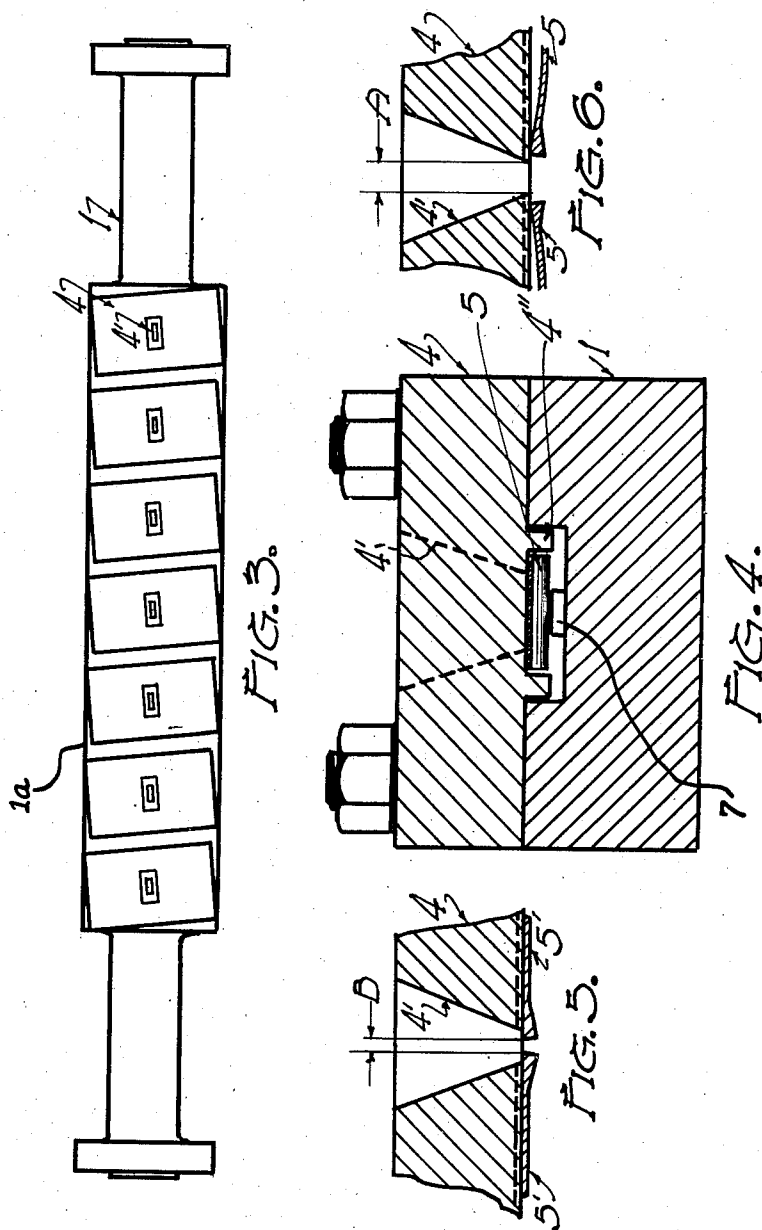
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UNITED STATES PATENT OFFICE

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SELF-CLEANING HYDRAULIC SPRAY
DEVICEEdwin B. Hudson, Middletown, Ohio, assignor to
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Application June 30, 1938, Serial No. 216,848

8 Claims. (Cl. 299—59)

My invention has to do with the provision of a spray device of particular utility where spray nozzles are likely to become clogged with materials entrained in the fluid being sprayed, and under circumstances where interruption of the spraying operation from any such cause is commercially undesirable. I shall describe my invention in connection with the spraying of hot rolled metal in rolling mills; but it will be understood that my invention is not limited thereto and will find application in other fields.

To remove scale from hot rolled products such as hot rolled iron or steel strip, the use of high pressure water sprays (approximately 1000 p. s. i.) impinging upon the freshly rolled metal while hot, has proved very effective. But the practical operation of such sprays has involved difficulty due to stoppage of the spray heads by scale or other materials entrained in the water supply. The stoppage of a single spray head causes considerable damage to the product, especially in wide strip where a band of undislodged scale may remain on the product throughout its length or a great portion of its length. This product defect is a serious one, because the band of undislodged scale cannot be removed in the subsequent pickling steps without over-pickling the portions of the strip which are free of scale. As a consequence, when a stoppage of a spray head or nozzle occurs, it is further necessary to stop the mill until the spray is clear. Obviously, this results in a serious loss of tonnage and added cost.

A primary object of my invention is to provide a spray nozzle in which stoppage is greatly minimized and in most instances, rendered impossible due to the opening of the orifice when the spray is shut off. This releases any object which may be causing the stoppage. It is further my object to provide a device in which the opening and closing of the orifice is entirely automatic because it is actuated by the water pressure in the header supply. It is further an object of my invention to provide a device of the character referred to which is inexpensive and simple to manufacture and in which the parts subject to wear are themselves inexpensive and readily replaceable.

These and other objects of my invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts of which I shall now describe the aforesaid exemplary embodiment.

Reference is made to the drawings, wherein:

Figure 1 is a plan view with parts in section of an orifice member.

Fig. 2 is a sectional view thereof taken longitudinally of the drawing of Fig. 1.

Fig. 3 is a plan view of a spray installation.

Fig. 4 is a sectional view taken along the lines I—I of Fig. 2.

Fig. 5 is a partial sectional view through the orifice showing the automatically acting members in constricted position.

Figure 6 is a partial sectional view taken through the orifice showing the automatically acting members in opened position.

In Fig. 3 I have shown generally a spray assembly for the particular use referred to, which spray assembly is in the form of a unitary casting 1 to which spray assembly devices are attached. It will be understood that different forms of construction may be adopted in the practice of my invention. In the particular form illustrated, the casting 1 is in the form of a flanged member to which connections to a high pressure water supply (not shown) may be made at both ends. Intermediate its ends the casting is formed above the conduit portion to present a flat surface indicated at 1a.

A section through the intermediate portion of the installation is shown in Fig. 2 and similar parts are similarly marked. The enlarged section 1a is perforated as at 2 by passageways entering an orifice chamber 3 to which the high pressure water is supplied. The members 4 are in the form of cover plates bolted on to the portion 1a. In Fig. 3 they are shown in slightly staggered position. This is for the purpose of causing the sprays to lie in echelon. The actual spray orifices are in the form of elongated, variable slots which produce high pressure sprays of fan shape. Consequently, the structure of Fig. 3 is constructed to deliver what may be termed a continuous spray of high pressure water stretching across the entire face of a hot rolled strip passing beneath or above the structure of Fig. 3 and travelling generally transversely to the axis of the structure of Fig. 3.

The cover plates 4 are provided with openings 4' which are tapered in form, as shown, and which are somewhat larger than the dimensions of the spray coming normally through these orifices.

Adjacent inside face of the plates 4, I have provided two spring plates 5 which are bent to a curvature as shown in dotted lines in Fig. 2. When the water pressure is off, these spring plates normally follow this curvature; and when

they do so the ends of the plates are clear of the orifice 4' as shown clearly in Fig. 6.

In mounting the spring plates, I prefer to relieve the member 1a adjacent the ends of the pressure chamber 3 so as to accommodate the ends of the plates. It is convenient also to perforate the ends of the plates to accept the dowels 6 which hold them in position; and the portions 1a and 4 of the structure will likewise be drilled to receive the dowels. I find that this is a convenient method of mounting and positioning the orifice members, and a method which makes for ready replacement. It is merely necessary to unbolt the plate 4, slip the worn out or broken orifice plates off the dowels, put new plates on the dowels, and bolt the plates back into position.

When water pressure is applied the plates 5 flatten against the plate 4 and assume the position shown in solid lines at 5' at Figs. 2 and 5. The ends of the orifice plates, therefore, act to reduce the orifice from the width A, shown in Fig. 6 to the width B shown in Fig. 5. There are no dimensional limitations which apply here, and the skilled worker in the art will find it readily possible to select an orifice width appropriate to his purpose. In practice, for the exemplary purpose set forth, the narrowest spacing of the ends of the plates when pressure is applied in spraying water on the hot metal is $\frac{1}{2}$ "', while the widest spacing of the ends, as shown in Fig. 6, is about $\frac{3}{4}$ "'.

If side guides 4'' are provided on the plates 4 as illustrated in Fig. 1 (the part 1a being relieved to accept them) one dowel may be used to mount each orifice member, and the side guides 4'' will keep the plates essentially from pivotal movement about the dowel pins. The orifice members 5 may be made of any suitable metallic material of resilient character which will not rust; and the ends projecting over the orifice 4' (shown enlarged in the drawings) may be protected against wear by welding onto them a suitable abrasion-resistant metal as will be readily understood in the art. The part 1a may be provided with suitable supporting ribs 7, curved to conform to the orifice members 5 when in the position shown in dotted lines.

In the operation of the device the application of pressure causes, as will be understood, a restriction of the orifice. When the pressure is relieved, the orifice opens up, so that it is self cleaning. In the spraying of hot metal as aforesaid, it is common practice to turn the water on and off for each piece as it passes under the spray head. This is frequently accomplished by the use of electrically operated valves, and flag switches which are acted upon by the pieces of hot metal passing along a conveyor; but it may be accomplished in other ways. In a system of this sort it will be evident that my spray nozzles are automatically cleaned for the spraying of each individual piece. Also during the continuance of the water pressure in each operation there may be some movement of the plates and change in the shape of the spraying orifice due to changes in the water pressure.

The cover plates 4 may be relieved slightly, if desired, over a portion at least of their area of contact with the orifice members.

Modification may be made in my invention without departing from the spirit of it.

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

1. In a spray nozzle, a pressure chamber, a cover for said pressure chamber having an orifice, and within said pressure chamber and adjacent said orifice at least one orifice controlling member comprising a plate of resilient material normally curved, said plate being fastened at one end, and the other end of said plate lying adjacent said orifice whereby when fluid pressure is exerted against said member, it will tend to flatten, moving said last mentioned end across a portion of said orifice.

2. In a spray head, means providing a pressure chamber and a cover therefor, said cover having an orifice, and a deformable element within said pressure chamber having a movable portion in proximity to said orifice and adapted to move in a direction across said orifice to restrict it under the influence of pressure in said chamber, said deformable element having also a portion fixed in said chamber to limit the movement of said movable portion, whereby a working orifice is provided under normal and greater pressures, which orifice becomes larger in effective area upon relief of pressure.

3. In a spray head, means providing a pressure chamber and a cover therefor, a pair of spring metal plates fixedly mounted at one end in said pressure chamber, the other ends of said plates being opposed in proximity to an orifice in said cover, said plates being normally curved, and so located as to be flattened by fluid pressure in said pressure chamber, whereby the ends of said plates are brought more nearly together across said orifice.

4. In a spray head, a casting comprising a conduit portion and a head portion, a cover plate for said head portion, said cover plate and head portion having edges in juxtaposition, and said head portion being hollowed interiorly to form a pressure chamber having communication with said conduit portion, a spring metal plate having one end engaged between edges of said head portion and cover plate, and another end lying adjacent an orifice in said cover member, said plate normally having a curved form, and lying in a position to be acted upon on essentially one side only by pressure in said pressure chamber, whereby upon the flattening of said plate said last mentioned end is adapted to move in a direction across said orifice.

5. In a device of the character described, a body comprising a conduit and a head, said head being hollowed to provide a pressure chamber having communication with said conduit, a cover for said head having an orifice therein, a pair of spring metal plates engaged between said head and said cover at one end of each of said plates, the other ends of said plates approaching each other adjacent said orifice, said plates being normally curved whereby pressure in said pressure chamber will tend to flatten said plates and move the ends thereof more closely together at said orifice.

6. In a device of the character described, a body comprising a conduit and a head, said head being hollowed to provide a pressure chamber having communication with said conduit, a cover for said head having an orifice therein, a pair of spring metal plates engaged between said head and said cover at one end of each of said plates, the other ends of said plates approaching each other adjacent said orifice, said plates being normally curved whereby pressure in said pressure chamber will tend to flatten said plates and move the ends thereof more closely together at said

orifice, said plates having enlarged ends formed of abrasion-resisting material.

7. In a device of the character described, a body comprising a conduit and a head, said head being hollowed to provide a pressure chamber having communication with said conduit, a cover for said head having an orifice therein, a pair of spring metal plates engaged between said head and said cover at one end of each of said plates, the other ends of said plates approaching each other adjacent said orifice, said plates being normally curved whereby pressure in said pressure chamber will tend to flatten said plates and move the ends thereof more closely together at said orifice, said plates being engaged at said first mentioned ends on dowels including said head and said cover, said cover having ribs between which said plates are guided in their movements as aforesaid.

8. In a device of the character described, a

body comprising a conduit and a head, said head being hollowed to provide a pressure chamber having communication with said conduit, a cover for said head having an orifice therein, a pair of spring metal plates engaged between said head and said cover at one end of each of said plates, the other ends of said plates approaching each other adjacent said orifice, said plates being normally curved whereby pressure in said pressure chamber will tend to flatten said plates and move the ends thereof more closely together at said orifice, said plates being engaged at said first mentioned ends on dowels entering said head and said cover, said cover having ribs between which said plates are guided in their movements as aforesaid, and said pressure chamber having supporting ribs shaped to contact said plates when in curved position.

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