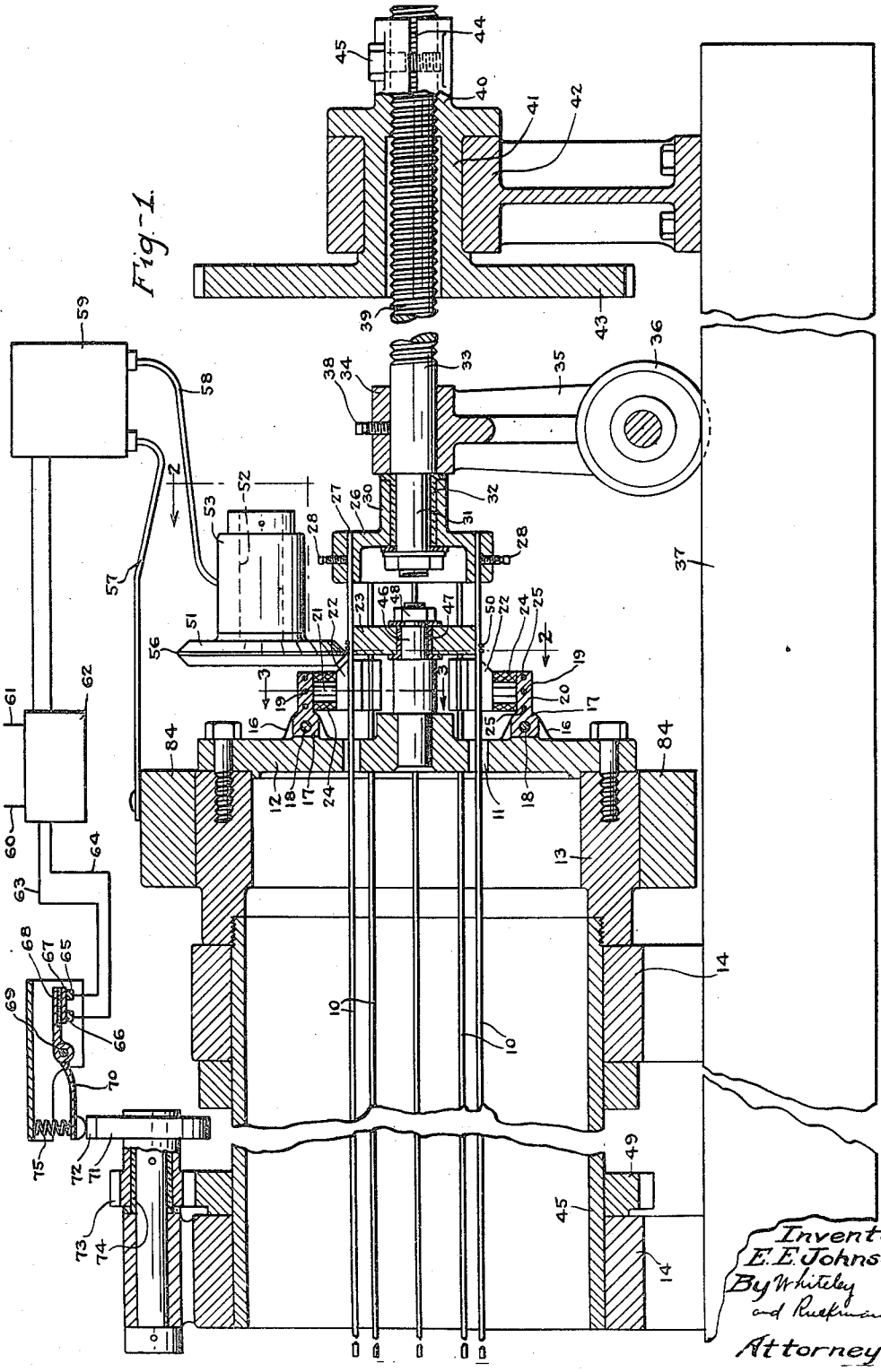
July 7, 1936. E. E. JOHNSON 2,046,457

WELL SCREEN

Original Filed July 12, 1930 2 Sheets-Sheet 1

Fig. 1.

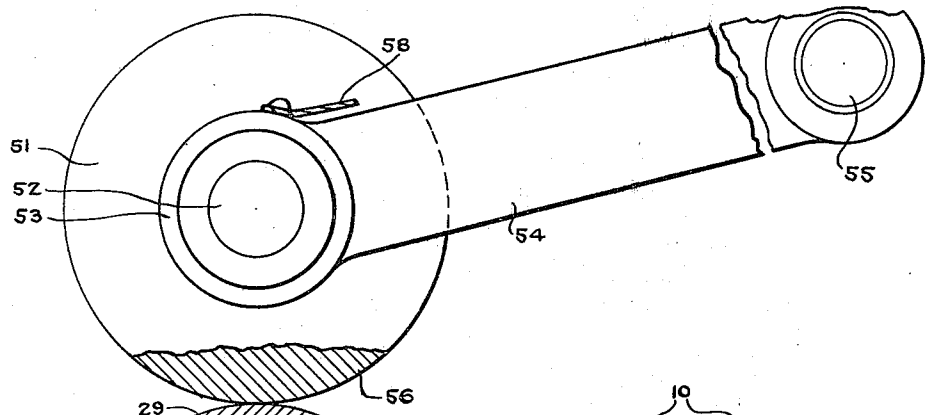


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WELL SCREEN

Original Filed July 12, 1930 2 Sheets-Sheet 2



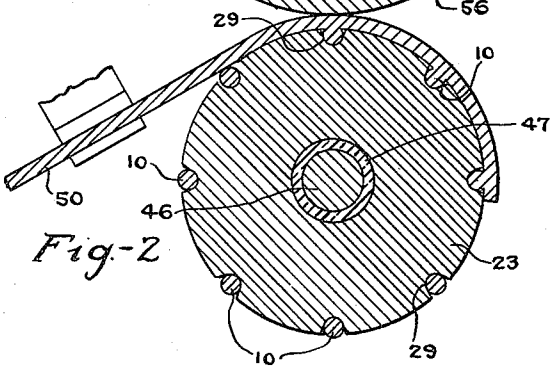


Fig-2

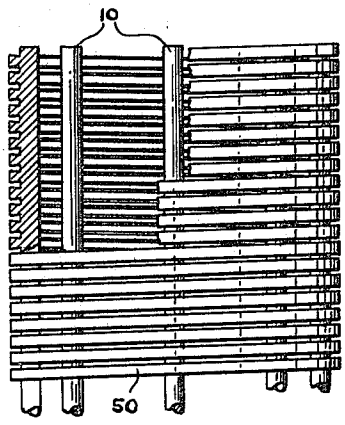


Fig-4

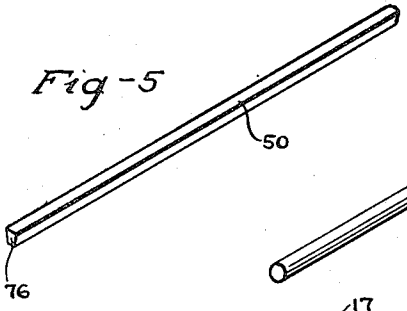


Fig-5

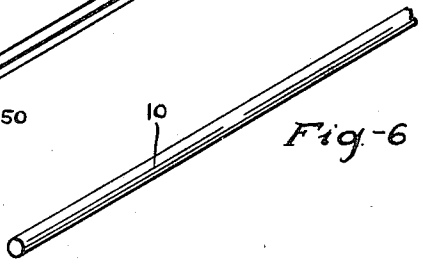


Fig-6

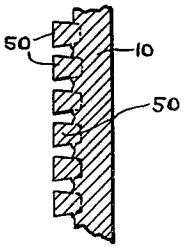


Fig-7

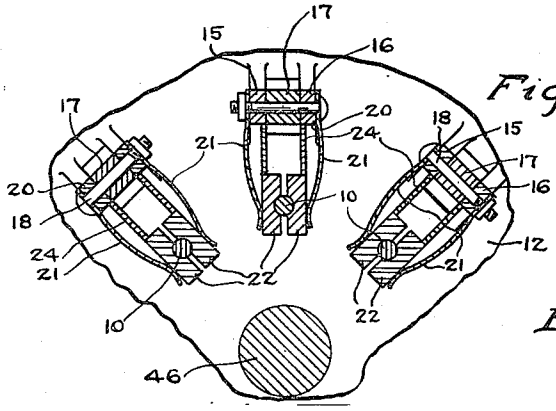


Fig-3

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Patented July 7, 1936 2,046,457

UNITED STATES PATENT OFFICE

2,046,457

WELL SCREEN

Edward E. Johnson, St. Paul, Minn., assignor to Edward E. Johnson, Incorporated, St. Paul, Minn., a corporation

Application July 12, 1930, Serial No. 467,527
Renewed November 29, 1935

5 Claims. (Cl. 166—8)

My invention relates to well screens and the process of making the same. It is the chief object of my invention to produce a well screen of particularly efficient and economical construction which will be at the same time light and so strong that it can resist the very severe strains to which it will be subjected in being introduced into deep well borings, such, for example, as oil wells.

The results of my invention are accomplished by providing a cage of longitudinal wires or rods, preferably of rust-resisting material, and to wind upon said rods a continuous wire also preferably of rust-resisting material, winding said wire in a helix with suitable spacing between adjacent coils and to spot weld the wire to each of the rods forming the cage at each crossing thereof. In this manner the helically-wound wire and the longitudinal rods are integrally united metal and metal, with the result that a peculiarly rigid and unyielding and indestructible type of structure is developed.

I have shown in the drawings somewhat diagrammatically a mechanism suitable fr a practice of my process. It is, however, to be understood that many other types of mechanism might be used or that the process may be practiced by manual means independent of any specific mechanism.

The claims for the invention of the machine here shown will be made in a separate application hereinafter to be filed.

In the drawings,—

Fig. 1 is a longitudinal sectional view of a machine for carrying out my process. Fig. 2 is a transverse part sectional view on lines 2—2 of Fig. 1. Fig. 3 is a sectional enlarged view of electrical contact pieces engaging the longitudinal wires or rods to effect circuit contact for the welding operation. Fig. 4 is an elevation view of a portion of a screen member made in accordance with my process with some parts in section and broken away. Figs. 5 and 6 are perspective views of two different types of wires which may be employed. Fig. 7 is an enlarged sectional view taken transversely across the wires and through one of the rods showing the manner in which the rods and wires are made integral.

The longitudinal rods 10 are carried through apertures 11 in a head 12 bolted to a ring 13 secured to a rotatable shell or tubular support 85 carried in a bearing 14 of a suitable frame member. Secured to the head 12 are pairs of lugs 15, 16 between which are fingers 17 pivoted to the lugs by means of the pivot bolts 18 but restrained from dropping down by engagement of their flat surfaces with the face of plate 12. As shown in detail in Figs. 1 and 3, the fingers 17 have pivotally connected at the sides thereof through bolts 19 lugs or nuts 20 carrying spring members 21 which forcibly engage contact pieces 22 each formed with correspondingly positioned semi-circular grooves for embracing the longitudinal wires or rods 10 which are to be used as the longitudinal members to form my well screen. The contact pieces 22 are suspended by means of flexible members 24 pivotally secured to the fingers 17 by other bolts 25, as clearly shown in Fig. 1. The rods 10 after passing through the contact pieces 22 pass over a circular anvil 23 to a second or clamping head 26, which is provided with apertures 27 for receiving the ends of the rods 10. By means of set-bolts 28, the rods 10 are clamped to the second head 26. The anvil head 23 is carried upon a bolt head 46, being insulated therefrom by a bushing 47 and secured to rotate with head 12 by means of a nut 48 threaded on the end of said bolt member 46. As clearly shown in Fig. 2, the head 23 is provided with transverse grooves 29 of a depth a little less than the diameter of the rods 10 and equally spaced about the head 23. The grooves 29 are in alinement with the bores 27 in the head piece 26 and are of a depth slightly less than the diameter of the rods 10 so that when said rods are secured by set-screws 28 to the head 27 they will be held at the bottoms of the grooves 29.

The head piece 26 is carried by a hub 30 which is revolubly mounted upon a pin 31, the head 26 and hub 30 being insulated from the pin 31 by means of an insulating bushing 32. The pin 31 is fast on the end of a shaft 33 having a bearing in a carriage 34 mounted upon a bracket 35 which is supported by the rollers 36 which run along any suitable way 37, the shaft 33 being held from turning in the bearing 34 by means of a set-bolt 38. The shaft 33 has a threaded portion 39 which is as long as the length of the screen to be formed, preferably around sixteen feet long. The threaded portion of this shaft is engaged by an internal thread on a rotatable nut 40 having a bearing 41 in frame member 42 and being provided with a driving gear 43. The nut 40 is split as at 44 with a bolt 45 for clamping it with the desired degree of firmness upon the threaded portion 39 of the rod 33.

It will be understood that the guide head 12 and parts attached thereto, including the con-

tact pieces 22 and the anvil head 23, is removably secured to the bearing ring 13, and other heads with parts positioned for receiving rods for other diameters of screen are interchangeable with the head 12 shown. It is also true that the securing head 26 is interchangeable with heads corresponding for different diameters of screens. By merely changing these heads and associated parts, screens of any desired diameter up to the maximum diameter of the tubular rotating support 85 may readily be constructed.

The shell or tubular support 85 has secured thereto a spur gear 49 by which said shell and the parts hereinbefore described, including the head 12, anvil 23 and head 26, are rotated at a desired rate of speed. At the same time, through gear 43, the drive nut 40 is correspondingly rotated whereby the cage of rods 10 will be given a longitudinal movement simultaneously with the aforesaid rotating movement, such that a wire 50 of any desired size and cross-sectional shape will be caused to coil itself about the cage of rods helically with the several coils spaced from one another a uniform distance which is predetermined for any particular type of screen to be manufactured by the pitch of the coacting screw threads and the rate of revolution of the feed nut 40.

Adapted to ride upon the wire 50 is a welding contact disc 51 having its shaft 52 mounted to rotate in a hub 53 supported by a pivot arm 54, which arm is mounted on a frame piece not shown and indicated as pivoted at 55. The welding disc 51 is provided with a welding edge or face 56 of a suitable shape to engage sharply the wire 50 beneath it, and the weight of the welding disc and associated parts is considerable, so that said disc is pressed upon the wire with a sufficient degree of force. A contact wire 57 is connected with the contact bearing ring 84, and another contact wire 58 is connected with the hub 53 carrying the welding disc 51. The contact wires 57 and 58 lead from a transformer 59, and when electrical current is passed to the transformer said wires 57 and 58 will form a circuit which passes current through the rods 10 and the wire 50 at its crossing point of said rods and through the welding disc back to the transformer.

Means for effecting constant periodical closing of the circuit are as follows: Incoming current 60 and outgoing current 61 go through the contactor relay shown diagrammatically at 62. These wires are continued respectively at 63 and 64 to the contact pieces 65 and 66. These pieces are spaced a suitable distance and adapted to be put in circuit by a circuit closing piece 67 carried on one arm 68 of a rocking lever pivoted at 69 and having its other arm 70 pressed by a spring 75 against the face of a cam disc 71 having thereon a cam member 72. The cam disc is driven from the gear 49 through a pinion 73 and rotates on a bushing 74. The length of time during which the current will be applied may be adjusted by means of the width of the cam member 72, and in practice will be just sufficient to produce the most effective welding operation. It is also true that the cam disc 71, like other interchangeable parts hereinbefore described, will be made so that it will be available either directly in its actual size or through intermediate gearing so that it will effect closing of the circuit a number of times equal to the number of rods 10 employed in any particular diameter of screen, and rotation of cam disc 71 by gear 49 will always be at a speed just sufficient to cause the cam 72 to engage the cam end of the lever 70 and rock the same to bring the piece 67 into circuit closing position at the moment when the welding disc 51 rolling upon the wire 50 is passing over one of the rods 10. This results in greater flowing through the crossing point of said rod and wire, and, because of poor conductivity of the wire 50 and rod 10, that will generate sufficient heat at that point because of welding action between the wire 50 and the rod 10.

Not only does the weight of the welding disc and connected parts upon the wire 50 hold the same firmly on the anvil 23, but the wire 50 passes through a friction guide indicated diagrammatically at 78 on Fig. 2, which has the effect of holding the wire under tension. In this way the wire and rod at their crossing point will be pressed toward one another with a considerable degree of force so that when wire and rod soften because of the action of the electrical current each will be forced appreciably into the other and the welding action will unite them integrally together.

The nature of this welding action is clearly shown in Figs. 4 and 7. At the moment of welding, the metal of both the rod 10 and wire 50 at the crossing point will not only soften sufficiently so that the parts will sink one into the other, but at the point of crossing there will be complete flow of metal, effecting a perfect welding union so that the rod and wire will in fact become integrally united. Fig. 7 shows clearly how the wire sinks into the rod and the rod into the wire, and Fig. 4, in the sectional part, shows that rods and wires have become integrally united.

I have discovered that this process can be best practiced where both rods and wire are of material which is non-corrosive from water or mineral oil or such gases or liquids as will ordinarily be contacted with in any deep wells for water or oil. Furthermore, the metal of rods and wire should not have such great electrical conductivity as not to produce welding heat when current is passed through them. I have discovered that rods and wire are highly effective in the practice of my process when formed of an alloy of copper, silicon and manganese. One such alloy commercially available in quantity at the present time is made and sold under the trade name Everdur. This alloy is composed approximately of 96 per cent copper, 3 per cent silicon and 1 per cent manganese, and has proved effective in the practice of my process, and while I do not wish to be restricted to a metal of the exact composition of Everdur, I have discovered that it can be used in connection with my process most effectively, and I wish to claim that discovery as part of my invention.

The machine herein described will work effectively and satisfactorily to perform the process and produce the well screen herein described and claimed, but I do not wish to restrict myself in any way to the particular machine illustrated and described, as other machines materially different in structure and mode of operation from the one here described can be developed to effectively operate in the practice of my process, and quite obviously the process itself and the screen resulting from its practice can be practiced and evolved by hand manipulation.

The advantages of my invention will be quite apparent. A screen is provided with the least

possible weight of material wherein longitudinal and circumferential strands of material are integrally united at every crossing point, and wherein the helically-wound strands of wire are everywhere spaced a uniform distance one from the other, and wherein the continuous helical slot formed by the spacing between said coils of wire is practically unobstructed in its flow capacity from the outside to the inside of the screen. The wires may be round, as shown in Fig. 6, or, preferably, of romboidal shape, as shown at 76 in Fig. 5. When of romboidal shape the spaces between the slots will widen from the outside toward the inside so that the slight blocking of the continuous slots by the welding into the rods 10 will still leave maximum flow inwardly for the entire helical area of the whole uninterrupted slot from the beginning to the end throughout the length of the screen.

I claim:

1. A well screen consisting of a multiplicity of longitudinal rods positioned to outline a cylinder, and a helix of wire on said rods, said wire having a plane-topped surface turned outwardly and held in planes parallel with the axis of said cylinder, said wire and rods being merged and fused together at all crossing points and sunk one within the other the same predetermined distance so that the top surfaces of all of the helical coils form a substantially uniform cylindrical outer surface of the screen.

2. A well screen consisting of a multiplicity of longitudinal rods positioned to outline a cylinder, and a helix of wire on said rods, said wire having a plane-surfaced top wall and inwardly-converging side walls with said top surface turned outwardly, all the surfaces of said coils falling in a common cylindrical surface, and being held closely and uniformly spaced to form a continuous helical drainage slot of uniform width, said wire and all the coils thereof being metallically integrated with and fused into the rods at every crossing point thereof.

3. A well screen consisting of a multiplicity of longitudinal rods positioned to outline a cylinder, and a helix of wire on said rods, the coils of said helix being everywhere equally spaced, said wire and rods being merged and fused together at all crossing points and sunk one within the other the same predetermined distances so that the top surfaces of all of the helical coils lie in a cylindrical plane parallel with the axis of said cylinder.

4. A well screen consisting of a multiplicity of longitudinal rods positioned to outline a cylinder, and a helix of wire on said rods, the coils of said helix being equally spaced throughout, said wire having a plane top surface turned outwardly and held in planes parallel with the axis of said cylinder, said wire and rods being merged and fused together at all crossing points and sunk one within the other the same predetermined distances so that the top surfaces of all of the helical coils form a substantially uniform cylindrical outer surface of the screen.

5. A well screen consisting of a multiplicity of longitudinal rods positioned to outline a cylinder, and a helix of wire on said rods, the coils of said helix being everywhere equally spaced to form a continuous helical slot of uniform width throughout its length, said wire and rods being merged and fused together at all crossing points and sunk one within the other the same predetermined distance so the narrowest portions of the coils of said helical slot all lie in a cylindrical plane parallel with the axis of said cylinder.

EDWARD E. JOHNSON.