No. 878,290. PATENTED FEB. 4, 1908.

H. B. HUMPHREY.

WIRE ANNEALING FURNACE.

APPLICATION FILED JUNE 14, 1907.

Fig. 1.

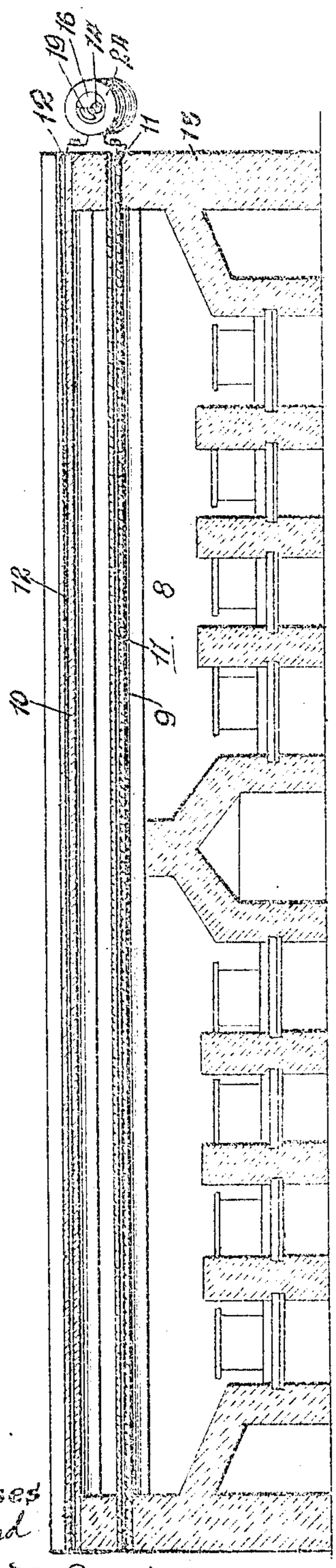

Fig. 2.

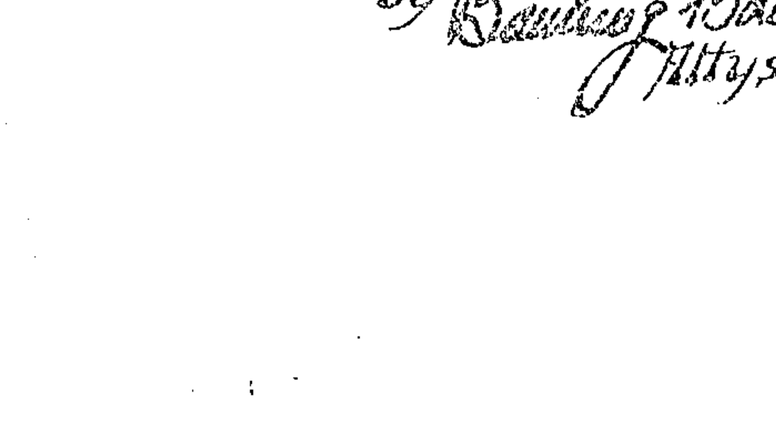

Fig. 3.

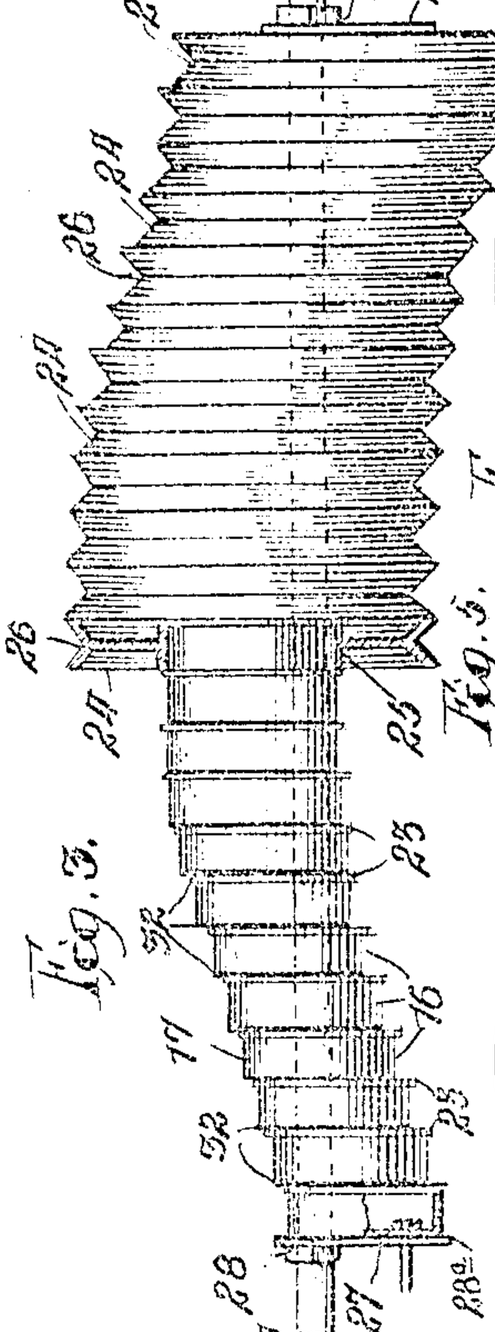

Fig. 4.

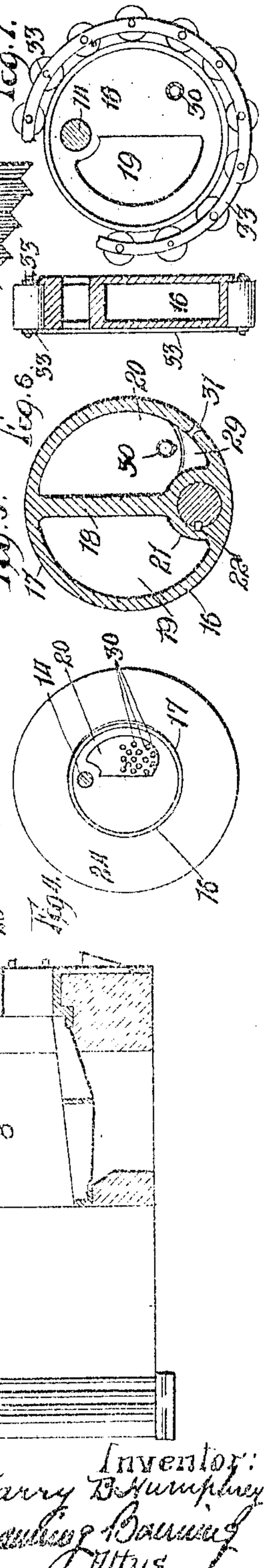

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 11.

Witnesses
W. P. Bond
Pierson W. Banning.

Inventor:
Harry B. Humphrey
by Banning & Banning
Attys

UNITED STATES PATENT OFFICE.

HARRY B. HUMPHREY, OF JOLIET, ILLINOIS, ASSIGNOR TO HUMPHREY & SONS, OF JOLIET, ILLINOIS, A COPARTNERSHIP CONSISTING OF HORACE FRED HUMPHREY AND HARRY B. HUMPHREY.

WIRE-ANNEALING FURNACE.

No. 878,290. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed June 14, 1907. Serial No. 379,014.

To all whom it may concern:

Be it known that I, HARRY B. HUMPHREY, a citizen of the United States, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Wire-Annealing Furnaces, of which the following is a specification.

In the art of making wire, after the wire has left the drawing block, it is ordinarily passed through an annealing furnace for the purpose of rendering it pliable; and, in furnaces of this class, it is customary to draw the wire through one of the arches of the furnace from end to end, and thereafter loop it back on itself and pass it through another arch. As the wire runs through with great rapidity, it is necessary to provide sheaves or rollers at the rear end of the furnace, around which the wire is carried; and, in ordinary furnace construction, it has been customary to arrange these rollers in horizontal line across the end of the furnace, although the wire is carried forward and back through superimposed arches. It is thus apparent that some of the rollers mounted upon the straight sheave will be out of alinement with the holes, from which and into which the wire passes, so that the wire will be drawn against the brick work of the arch, into which it will, before long, wear grooves or cuts, thereby weakening the arch structure, and finally tending to destroy it, and increasing the friction of the wire and the possibility of fraying or breaking it. This imperfect construction necessitates greater expenditure of power in drawing the wire through the furnace structure and is unsatisfactory from all points of view.

The object of the present invention is to overcome these difficulties by providing each pair of wire holes with a roller properly positioned to receive and discharge the wire in a line with the wire holes with which it coöperates, and to provide for the cooling and lubricating of the rollers or sheaves.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a longitudinal sectional elevation of the annealing furnace of the usual style, showing at one end the sheave mechanism of the present invention; Fig. 2 a half sectional view showing the end and interior structure of the furnace; Fig. 3 an enlarged view showing the sheaves and bearings; Fig. 4 a sectional view through the sheave showing one of the eccentrically mounted bearings and sheaves; Fig. 5 a sectional elevation through one of the sheaves; Fig. 6 a side elevation of a modified form of bearing; and Fig. 7 a cross sectional elevation of the same.

Fig. 1 illustrates an annealing furnace of the usual type, comprising a heating space 8, which is covered by means of a lower wire arch 9, and an upper wire arch 10, which extend from end to end of the furnace and which, in usual practice, will be from forty to fifty feet long. The arches are formed of fire brick or similar impervious substance, and are provided from end to end with a plurality of lower wire holes 11 and upper wire holes 12, in the lower and upper arches, respectively. The specific details of the furnace structure need not be further described, for the reason that the furnace itself differs in no way from the furnaces ordinarily employed for this class of work.

At the rear end wall 13 of the furnace is located a transversely extending horizontal fixed shaft 14 which, at its ends, is supported by rearwardly extending brackets 15 secured to the rear furnace wall, the shaft extending across the furnace at a level between the upper and lower wire holes, which, by reason of the arched formation of the furnace, will extend across in a curve coincident with the curvature of the arches. The shaft has mounted thereon a plurality of circular sheave bearings 16, most of which are arranged eccentrically on the stationary shaft, the degree of eccentricity being coincident with the curvature of the arches. Each of the intermediate sheave bearings is of open formation, comprising an outer circular bearing rim 17, and a partition wall 18 which divides the interior of the sheave bearing into a water chamber 19 on one side and a lubricating chamber 20 on the other side. The partition wall 18, at a suitable point, depending upon the intended position on the shaft of the particular bearing, is enlarged to provide a mounting 21 for the shaft. the bearing being positioned on the shaft by means of a key or spline 22, or in any other suitable manner. In Fig. 3, the bearings near the outer ends of the shaft have the mounting 21 near the upper margin of the bearing, as shown in Fig. 4, and hang down therefrom, while the bearings near the center

of the shaft are passed through mountings which are located near the lower margin, as indicated in Fig. 5, while the intermediate bearings are provided with mountings at suitable points in the partition wall 18 to maintain the bearings upon the shaft at a proper elevation to conform to the curvature of the arches. Each of the bearings has, at one side, a flange 23, which serves to position a sheave 24, comprising a ring shaped hub 25, which surrounds the intended bearing, and a grooved periphery 26 adapted to receive the wire. When the several bearings are fixed on the shaft, in the manner shown in Fig. 3, the single flanges of adjacent bearings will combine together to provide flange surfaces on each side of the hubs of the sheaves, so that the provision of double flanges on each of the individual bearings is unnecessary. The outer bearing of the series, however, differs from the remaining bearings, in that it is provided with a solid end wall 27, closing the water chamber, while the remainder of the bearings are cut through from side to side. On the shaft, outside of the end bearings, are nuts 28, bearing against false plates 28ª, which latter serve to position the outer sheaves, on their outer sides, in the same manner that the adjacent flanges position the inner sheaves on both sides. The lubricating chambers 20 of the bearings are each provided, in the lower side, with a cup or pocket 29, which is cored or hollowed out to receive oil from a pipe 30, one of which pipes preferably extends to each oil cup, although a single pipe can be employed to supply all of the cups; and the oil retained in the pocket 29 is adapted to discharge through a vent hole 31, the bearings being so positioned on the shaft that the lubricating chambers of all the bearings will be on the inside of the shaft and next to the furnace wall, which position will tend to discharge the oil into the hub of the surrounding shaft at the point of greatest clearance, which will always be on the side opposite to that around which the wire is traveling, the tension of the wire serving to hold the sheave in tight engagement with the bearing at one side, and affording a slight clearance on the other side. The water chambers of the bearings, being in communication with one another, will form a water passage from end to end of the bearing structure, which permits water to flow through the bearings so as to cool them and prevent jamming of the sheaves, which might otherwise occur by reason of the high temperature at which the wire is carried around the sheaves, which will be consequently heated to a high degree. In order to prevent leakage, it is desirable to interpose a packing ring 32 between the adjacent bearings of the series.

Figs. 6 and 7 show a roller bearing, which may be employed if additional ease of movement is desired, which bearing, as shown, comprises a pair of rings 33, between which a plurality of rollers are pivoted, the roller bearings being interposed between the periphery of the stationary bearing, previously described, and the surrounding sheave, which of course must have a sufficiently large opening through its hub to accommodate the rollers.

In use, a strand of wire is fed into the front end of the furnace, through a hole in one of the arches, and is looped around the coöperating sheave, whose upper and lower grooved bearing surfaces are in exact alinement with the upper and lower wire holes, respectively, so that the strand of wire will be carried around the sheave without any binding or friction, which would inevitably occur if the wheel were not positioned in the manner indicated. The wire is thus held out of abrasive contact with the brick work of the arch and runs forth and back through the annealing surface easily and perfectly and without any appreciable wear either to the wire itself or to the furnace structure. The formation of the bearings is one which provides a water space which will be formed in the ordinary operation of casting the bearings and at a point from which the metal would ordinarily be removed in any case; and the combined water spaces of the several bearings provide a water channel, whereby all danger of overheating is eliminated. In like manner the lubricating oil is applied, at the point of greatest efficiency, from suitable holes in the pipe or pipes 30, which is an extremely simple and efficient way of lubricating the parts, and obviates the necessity of providing oil cups or similar lubricating apparatus for each of the separate bearings. The invention is one which permits the employment of the furnace arch construction, which is the strongest type of construction, and at the same time obviates all the objections of this style of structure which have hitherto been present in cases in which the sheaves were not properly alined with the wire holes.

What I regard as new and desire to secure by Letters Patent is:

1. In combination with a wire annealing furnace having upper and lower arches provided with wire holes, a straight supporting shaft, a plurality of circular bearings eccentrically mounted on the shaft and in substantial alinement with the line of curvature of the wire holes in the arches, and sheaves rotatably mounted on the bearings and having their wire travel surfaces in register with the upper and lower line of wire holes, substantially as described.

2. In combination with a wire annealing furnace having upper and lower arches provided with wire holes, a straight supporting

shaft, a plurality of circular bearings eccentrically mounted on the shaft and in substantial alinement with the line of curvature of the wire holes in the arches, the bearings being each provided with a water space of suitable size to coöperate with the water spaces in adjoining bearings to provide a water channel, and sheaves rotatably mounted on the bearings, substantially as described.

3. In combination with a wire annealing furnace having upper and lower arches provided with wire holes, a straight supporting shaft, a plurality of circular bearings eccentrically mounted on the shaft and in substantial alinement with the line of curvature of the wire holes in the arches, the bearings being each provided with a water space of suitable size to coöperate with the water spaces in adjoining bearings to provide a water channel, the bearings being further provided with oil pockets having oil vents adapted to lubricate the bearings, and sheaves rotatably mounted on the bearings, substantially as described.

4. In combination with a wire annealing furnace having upper and lower arches provided with wire holes, brackets on the end of the furnace, a stationary shaft supported by the brackets, a plurality of bearings, each comprising a flanged periphery and each having an oil chamber and a water chamber separated by means of a partition wall, the partition wall having formed therein a mounting for the shaft, said mountings being so positioned that when the bearings are inserted onto the shaft they will maintain a position co-incident with the line of curvature of the arches and form a water channel from end to end of the bearing structure, means for conveying oil to the several oil chambers, and sheaves rotatably mounted on the several bearings and having their bearing surfaces in register with the upper and lower wire holes with which they coöperate, substantially as described.

5. In combination with a wire annealing furnace having upper and lower arches provided with wire holes, brackets on the end of the furnace, a stationary shaft supported by the brackets, a plurality of bearings, each comprising a flanged periphery and each having an oil chamber and a water chamber separated by means of a partition wall, the partition wall having formed therein a mounting for the shaft, said mountings being so positioned that when the bearings are inserted onto the shaft they will maintain a position co-incident with the line of curvature of the arches and form a water channel from end to end of the bearing structure, means for conveying oil to the several chambers, sheaves carried by the bearings, and rollers interposed between the bearings and the sheaves, substantially as described.

HARRY B. HUMPHREY.

Witnesses:
WALKER BANNING,
SAMUEL W. BANNING.