No. 746,451. PATENTED DEC. 8, 1903.

H. P. BROWN.

FLEXIBLE SHAFT.

APPLICATION FILED APR. 7, 1902.

NO MODEL.

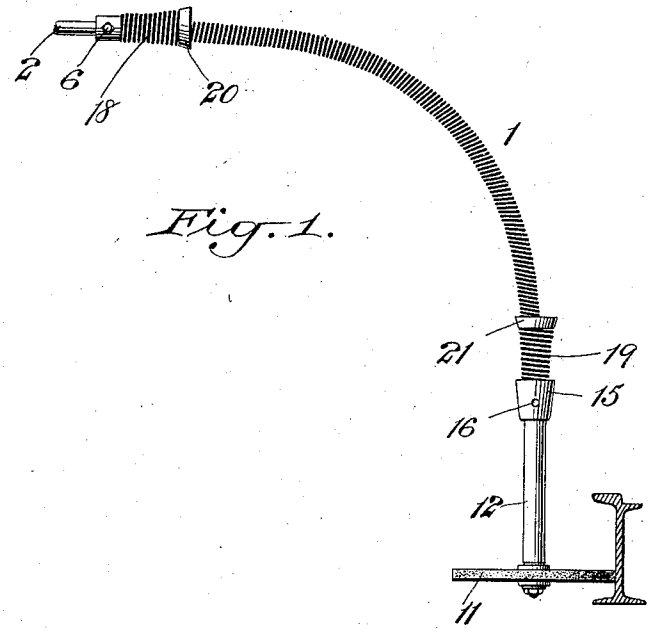


Fig. 1.

Fig. 2.

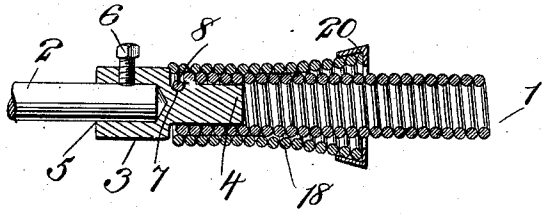


Fig. 3.

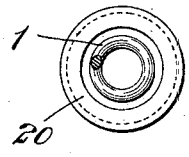
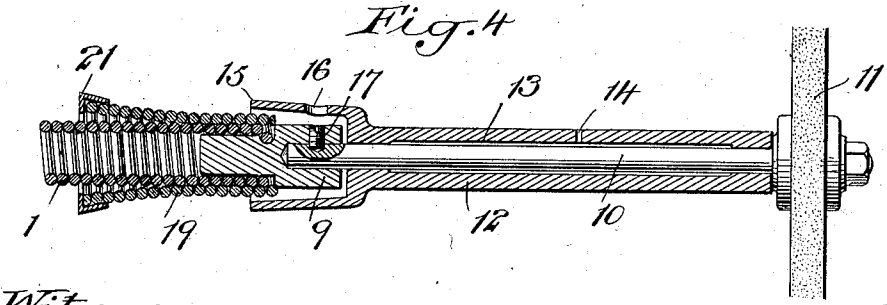


Fig. 4



Witnesses:-
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Henry J. Thieme.

Inventor:-
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his Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 746,451. Patented December 8, 1903.

UNITED STATES PATENT OFFICE.

HAROLD P. BROWN, OF MONTCLAIR, NEW JERSEY.

FLEXIBLE SHAFT.

SPECIFICATION forming part of Letters Patent No. 746,451, dated December 8, 1903.

Application filed April 7, 1902. Serial No. 101,785. (No model.)

To all whom it may concern:

Be it known that I, HAROLD P. BROWN, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented a new and useful Flexible Shaft, of which the following is a specification.

My invention relates to a flexible shaft, with the object in view of providing an efficient and durable shaft well adapted to all purposes for which a flexible shaft is used.

The ordinary flexible shafts used for mechanical purposes have an interior spiral core of coiled steel wire which rotates and an exterior spiral jacket which is stationary and which is used to protect the rotary core. The jacket is covered with a tube of textile material to keep out the dirt and keep in the lubrication.

My present invention provides a structure in which no lubrication is necessary and in which the shaft is arranged in such a way as to be self-supporting from its bearing ends.

In the accompanying drawings, Figure 1 is a view of the shaft as it appears when used for driving an emery-wheel for work upon railway-rails. Fig. 2 is an enlarged longitudinal section at the end of the shaft in connection with the solid driving-shaft. Fig. 3 is an end view of the same, and Fig. 4 is a longitudinal section of the end of the shaft attached to the driving-spindle working in the elongated sleeve at the end of the shaft where the device to be driven is located.

The shaft is denoted by 1 and preferably consists of a steel wire in the form of a spiral coil. It is secured to the solid shaft 2, from which it is rotated by means of a coupling 3, reduced at one end 4 to fit easily within the spiral coil forming the shaft 1 and at its opposite end provided with a socket 5 for the reception of the end of the shaft 2, to which it is conveniently locked by means of a set-screw 6, passing through the wall of the coupling 3 and bearing against the shaft 2.

The shaft 1 is conveniently locked to the reduced end 4 of the coupling by forcing the wire forming one of the coils of the shaft into a groove 7, formed transversely in the exterior of the reduced portion 4 of the coupling. The groove 7 may extend only a short distance along the periphery of the reduced portion 4, and the wire forming one of the coils of the shaft 1 may be forced into it either at the end of the wire or at a distance from the end of the wire, the particular wire which is forced into the groove, as represented in Fig. 2, being denoted by 8. This effectually prevents the shaft 1 from turning on the reduced portion 4 of the coupling and is a very simple means of locking it to the coupling, requiring no abrupt bend of the wire forming the shaft, which would tend to crack or weaken it. A coupling-piece 9, similar to the coupling-piece 3, is utilized to secure the opposite end of the shaft 1 to the spindle 10, to which the emery-wheel 11 or other suitable part to be driven is attached. The opposite end of the shaft may also be locked to the coupling-piece 9 in a manner quite similar to that already described for locking the end of the shaft to the coupling 3.

The spindle 10 is mounted in a long sleeve 12, the length of the sleeve 12 being sufficient to permit both hands of the operator, if required, to grasp the sleeve one above the other without danger of bringing the hand into proximity to the cutting-tool or the revolving spiral shaft where it would be liable to become injured. The bore 13 of the sleeve 12 is somewhat larger than the spindle 10, save only at its opposite end, where it is intended to fit the spindle to hold it similarly during its rotary movement. The enlarged bore 13 forms an oil-chamber into which oil may be introduced through a small opening 14 in the wall of the sleeve.

The sleeve 12 is provided at its end toward the coupling 9 with an enlarged socket portion 15, extending over the exposed end of the coupling 9 and preferably a short distance over the end of the spiral wire shaft to protect the hand of the operator from the shaft. This enlarged socket portion 15 is provided with an opening 16, through which a set-screw 17, seated in the wall of the coupling 9, is manipulated to lock the spindle 10 to and release it from the coupling 9.

A very important feature of my invention is the reinforcing-coils 18 19 in proximity to the couplings 3 and 9 at the opposite ends of the shaft. These reinforcing-coils 18 19 are formed bell-shaped and consist, preferably, of steel wire coiled in a manner quite similar to

that in which the wire 10 is coiled. A distance from the exposed part of the couplings 3 and 9 the wire of the reinforcing-coils 18 and 19 rests in contact with the coils of the shaft 1; but as the reinforcing-coils extend away from the coupling-pieces they gradually increase in diameter, their flaring ends being preferably capped by rings 20 21. This structure prevents the shaft 1 from being bent abruptly at the outer extremity of the reduced portion 4 of the coupling, causing it to assume a gradual curve, as shown in Fig. 1, and materially increases the life of the shaft, while overcoming any possibility of an injurious bending of the shaft by an inexperienced workman.

What I claim is—

1. A flexible shaft consisting of wire coiled in spiral form and bell-shaped coils located at the opposite ends of the shaft for reinforcing the shaft.

2. The combination with a coupling having a reduced portion for entering the end of a flexible shaft, of a flexible shaft locked to the reduced portion of the coupling and a bell-shaped reinforcing-coil fitted to the end of the shaft in proximity to the coupling.

3. A flexible shaft consisting of a wire coiled in spiral form, spiral wire cones fastened to the ends of the shaft to prevent abrupt bends and metal capping-rings to cap the open ends of the cones and prevent the ends of wire from injuring the operator.

4. The combination with a flexible shaft, of a sleeve sufficiently long to receive the hands of an operator one above the other, a spindle mounted in the sleeve, a coupling locked to the flexible shaft and provided with means for locking the spindle thereto and releasing it therefrom, the said spindle-containing sleeve being provided at its end toward the flexible shaft with an enlarged socket for receiving the said coupling and the wall of said socket being provided with an opening for gaining access to the means for locking the spindle to the coupling, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 25th day of March, 1902.

HAROLD P. BROWN.

Witnesses:
FREDK. HAYNES,
HENRY THIEME.