

No. 864,624.

PATENTED AUG. 27, 1907.

W. H. DOUGLAS.
FLEXIBLE SHAFT.

APPLICATION FILED SEPT. 26, 1906.

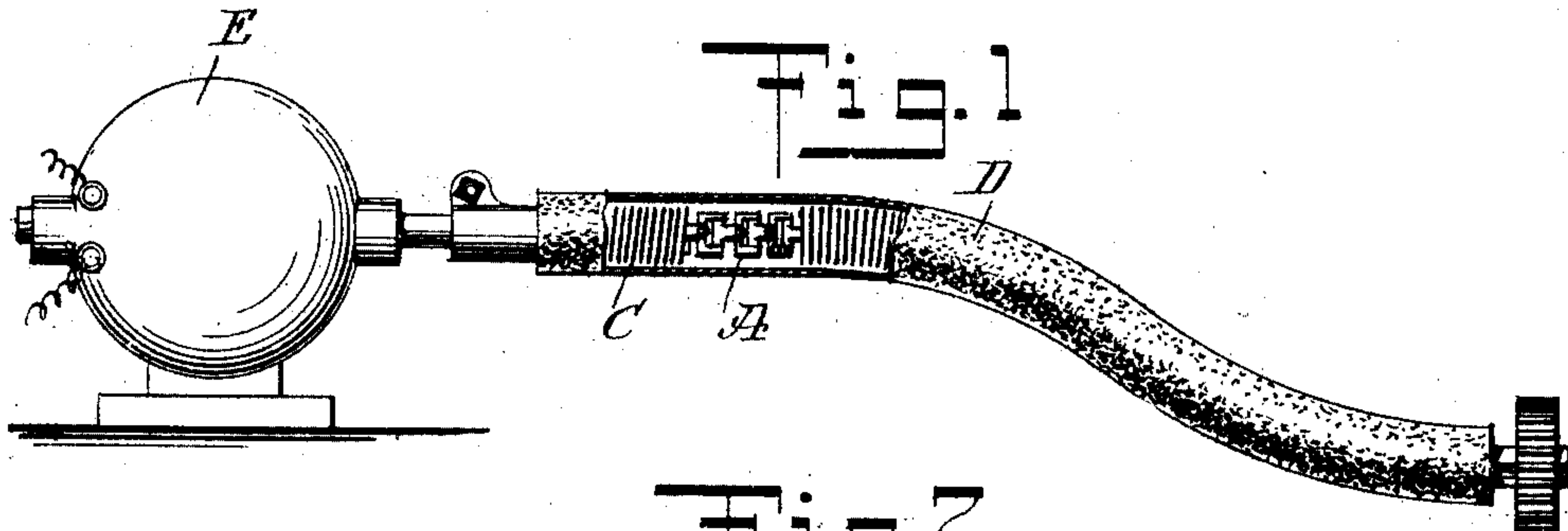


Fig. 1

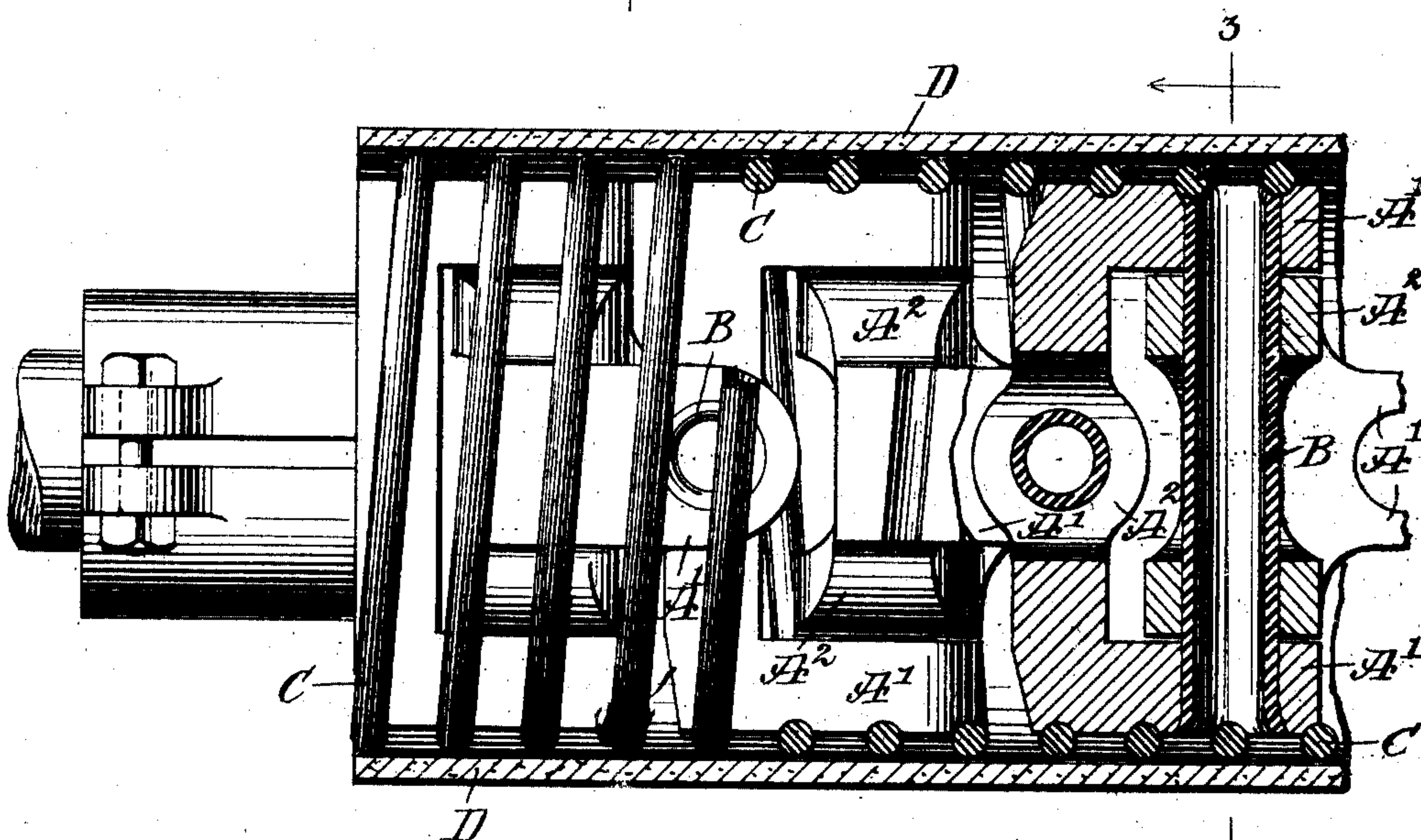
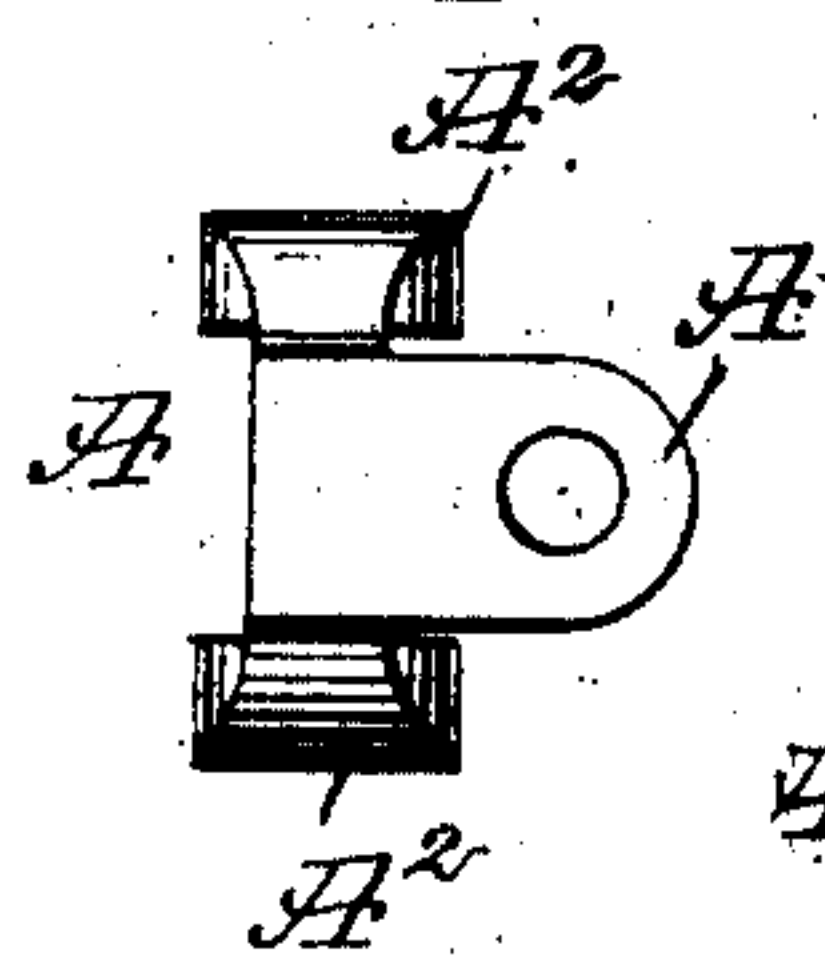


Fig. 2



WITNESSES

John S. Thompson
Geo. H. Foster

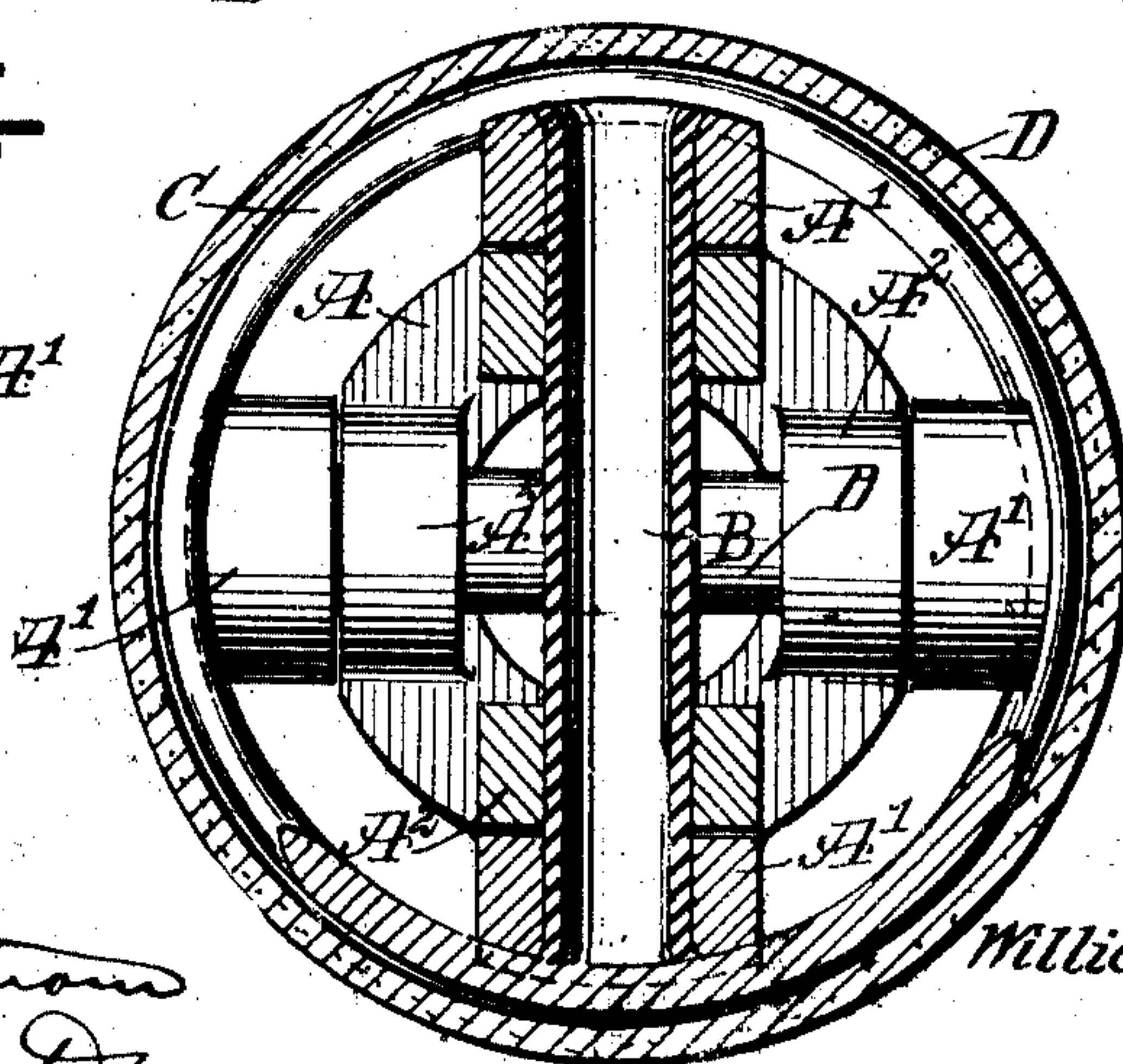


Fig. 3

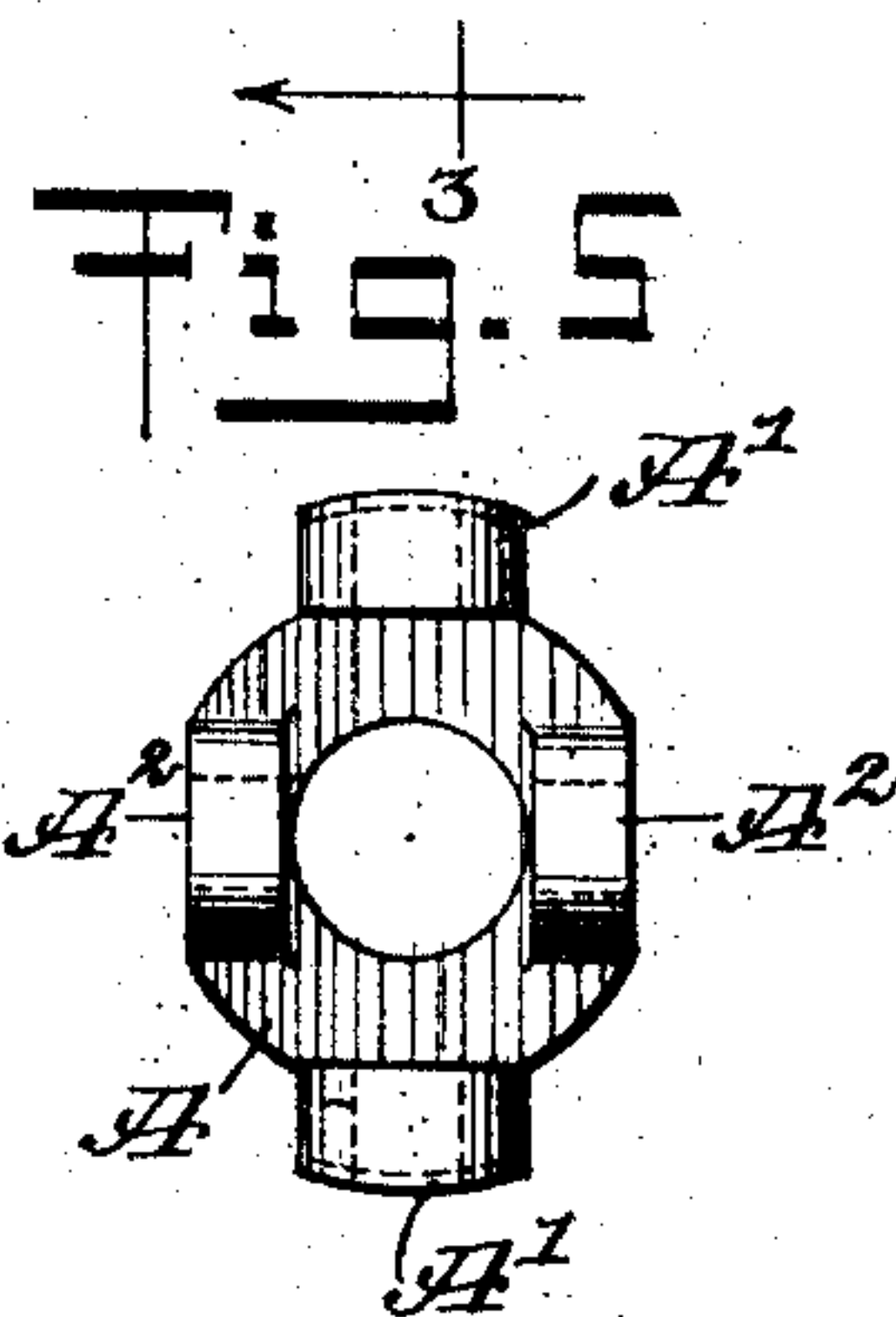


Fig. 5

INVENTOR

William Henry Douglas

BY *Mum Co*

ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM HENRY DOUGLAS, OF BELLEVILLE, NEW JERSEY, ASSIGNOR TO HEALEY & CO., OF NEW YORK, N. Y., A CORPORATION.

FLEXIBLE SHAFT.

No. 864,624.

Specification of Letters Patent.

Patented Aug. 27, 1907.

Application filed September 26, 1906. Serial No. 336,255.

To all whom it may concern:

Be it known that I, WILLIAM HENRY DOUGLAS, a citizen of the United States, and a resident of Belleville, in the county of Essex and State of New Jersey, have
5 invented a new and Improved Flexible Shaft, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved flexible shaft which is simple and durable in construction, and arranged to readily flex in any
10 desired direction without undue binding or straining of the parts or loss of the power to be transmitted.

The invention consists of novel features and parts and combinations of the same, which will be more fully described hereinafter and then pointed out in the
15 claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

20 Figure 1 is a side elevation of the improvement as applied; Fig. 2 is an enlarged sectional side elevation of the improvement; Fig. 3 is a transverse section of Fig. 2 on the line 3—3, parts thereof being removed. Fig. 4 is a reduced plan view of one of the knuckles,
25 and Fig. 5 is a face view of the same.

The flexible shaft consists essentially of a plurality of knuckles A, preferably made in ring shape, and each provided with sets of integral lugs A' and A² projecting longitudinally in the same direction and standing at right
30 angles to each other, the lugs in both sets being arranged diametrically opposite each other, and the inner faces of the lugs A' being spaced apart a distance corresponding approximately to the distance between the outer faces of the lugs A², so that the lugs A² of one knuckle
35 fit under and register with the lugs A' of an adjacent knuckle, as will be readily understood by reference to Figs. 1 and 2. The lugs A' extend integrally from the peripheral face of the knuckle while the lugs A² extend integrally from the face thereof (see Figs. 4 and 5), so
40 that practically the lugs A' are outermost relative to the innermost lugs A².

The lugs A² of a knuckle are mounted to swing on a pivot pin B secured at its ends in the lugs A' of the adjacent knuckle. The pivot pins B extend diametrically
45 of the knuckles and the pivot pin B of a knuckle is located in a plane at a right angle to the planes containing the lugs A² of the same knuckle. By the construction described a series of connected universal joints are produced, of which a single knuckle is common to two
50 successive joints.

The pivot pin B is preferably made tubular, to permit of conveniently beading up the terminals thereof on the corresponding lugs A', with a view to hold the parts in

place and allow convenient turning of the lugs A² of one knuckle A on the pivot pin B of the next adjacent
55 knuckle. The faces of the knuckles are preferably rounded off or made spherical to allow turning adjacent knuckles to as great an angular position relative to each other as possible.

The connected knuckles are surrounded by a spiral
60 spring C, which is preferably screwed onto the knuckles A by engaging the convolutions of the spring with the spiral screws formed on the exterior surface of the knuckles, and this spiral spring C is incased in a flexible
65 tube D of leather, rubber or other similar material. The spring C serves to hold the knuckles normally in a straight line position, but allows the knuckles to turn one relative to the other when bending the flexible shaft.

If desired the spring C can be placed inside of the
70 flexible shaft and in this case the pivots do not extend through a knuckle.

As shown in Fig. 1 the flexible shaft is connected with a motor E for transmitting the power thereof to other
75 machinery.

The flexible shaft shown and described is very simple and durable in construction, and is capable of flexing in any desired direction without undue binding or straining of the parts, and practically without loss of
80 the power to be transmitted.

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

1. A flexible shaft, comprising a plurality of knuckles, each having sets of rigid lugs extending longitudinally from one face of a knuckle, and diametrically extending
85 pivots each held in one set of lugs and engaged by a set of lugs of the adjacent knuckle the outer face of said knuckles being screw threaded and a spiral spring resting in the threads.

2. A flexible shaft, comprising a plurality of ring-shaped
90 knuckles each having sets of rigid lugs extending longitudinally on one face of a knuckle and at right angles one set to the other, and a diametrically extending pivot held in one set of lugs and pivotally engaged by a set
95 of lugs of the adjacent knuckle, each pivot pin being tubular and having its ends beaded in the outermost lugs of a knuckle.

3. A flexible shaft, comprising a plurality of knuckles, each having sets of rigid lugs extending longitudinally from one face of the knuckle, diametrically extending
100 pivots each held in one set of lugs and engaged by a set of lugs of the adjacent knuckle, a spiral spring surrounding the knuckles, said knuckles being threaded to receive the spring, and a flexible tube inclosing the said spiral spring.

In testimony whereof I have signed my name to this
105 specification in the presence of two subscribing witnesses.

WILLIAM HENRY DOUGLAS.

Witnesses:

THEO. G. HOSTER,

EVERARD B. MARSHALL.