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PATENTED DEC. 26, 1905.

H. A. BOND.
SHUTTLE FOR WIRE LOOMS.
APPLICATION FILED JULY 18, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

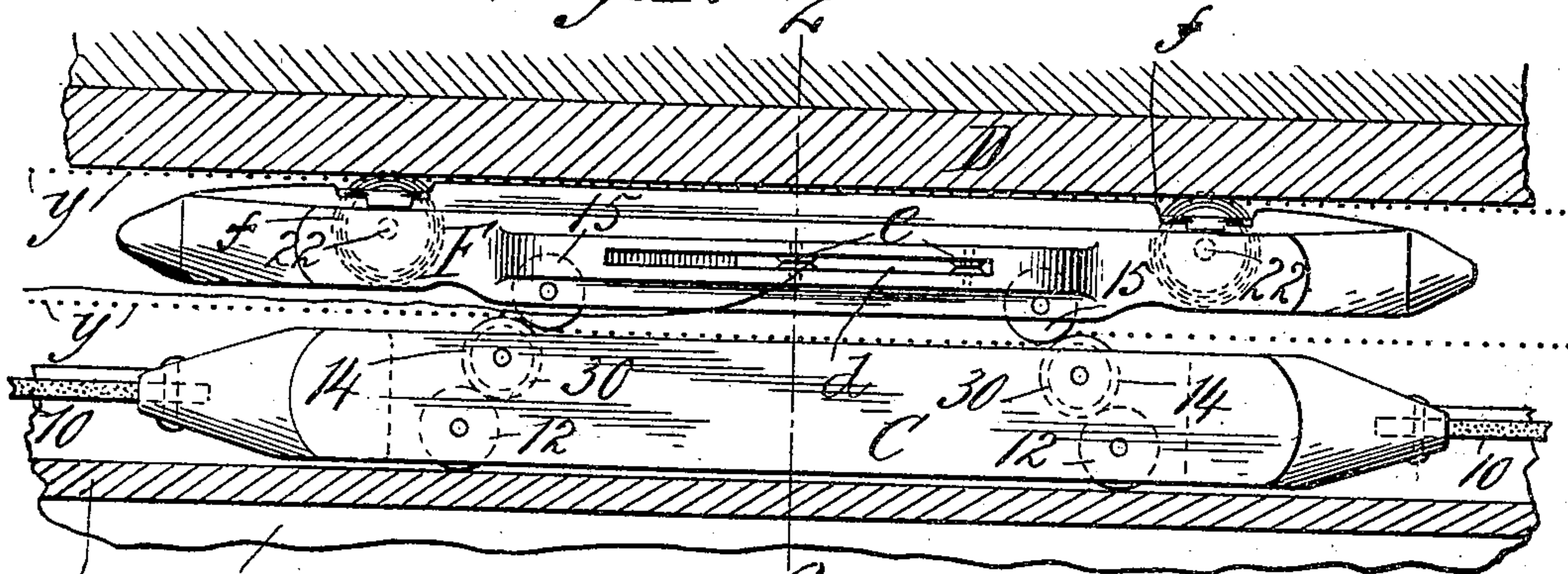


Fig. 2.

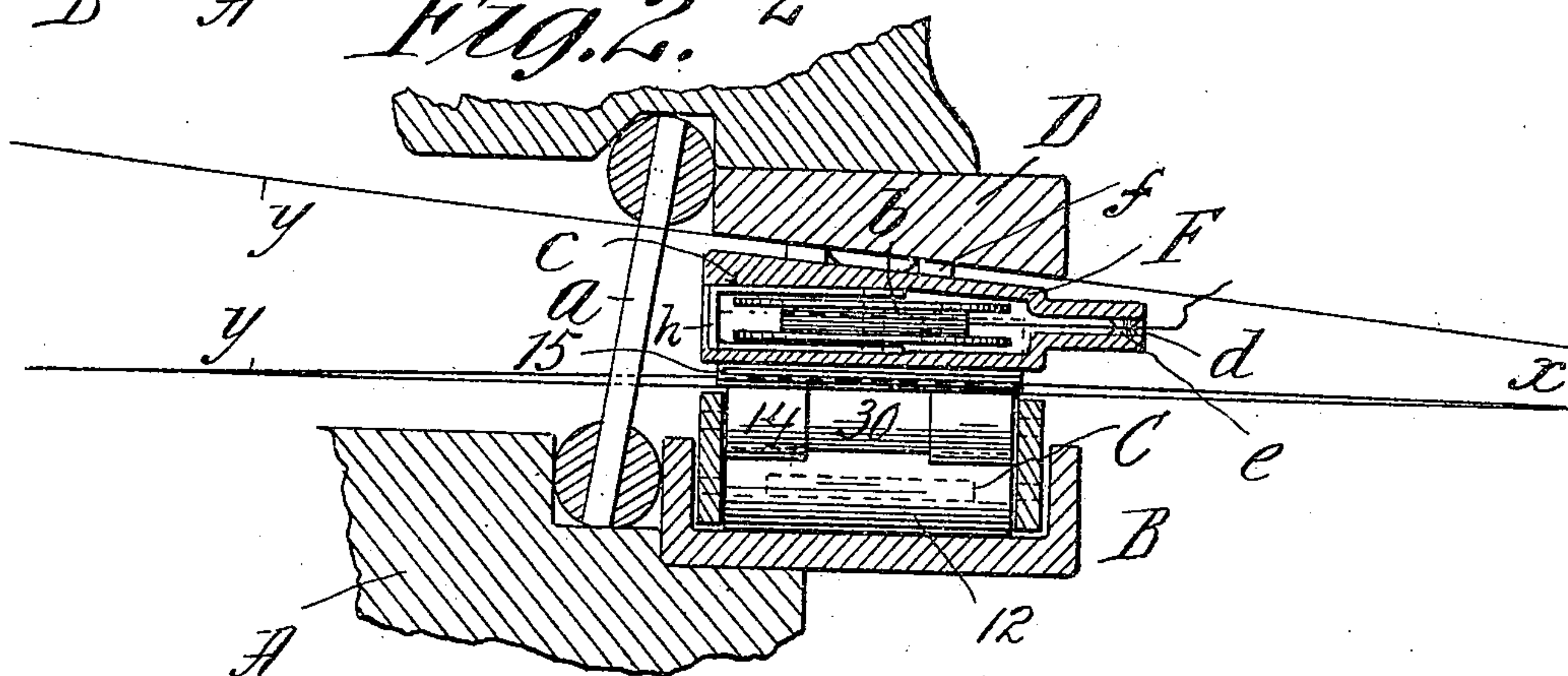
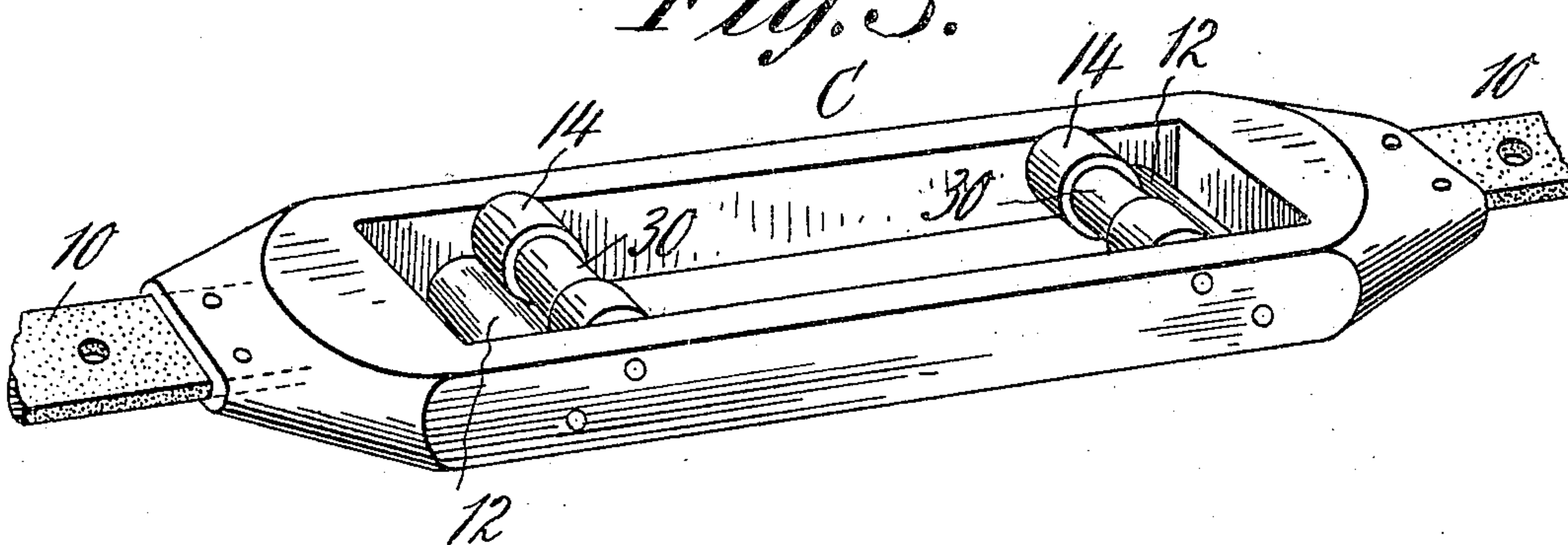


Fig. 3.



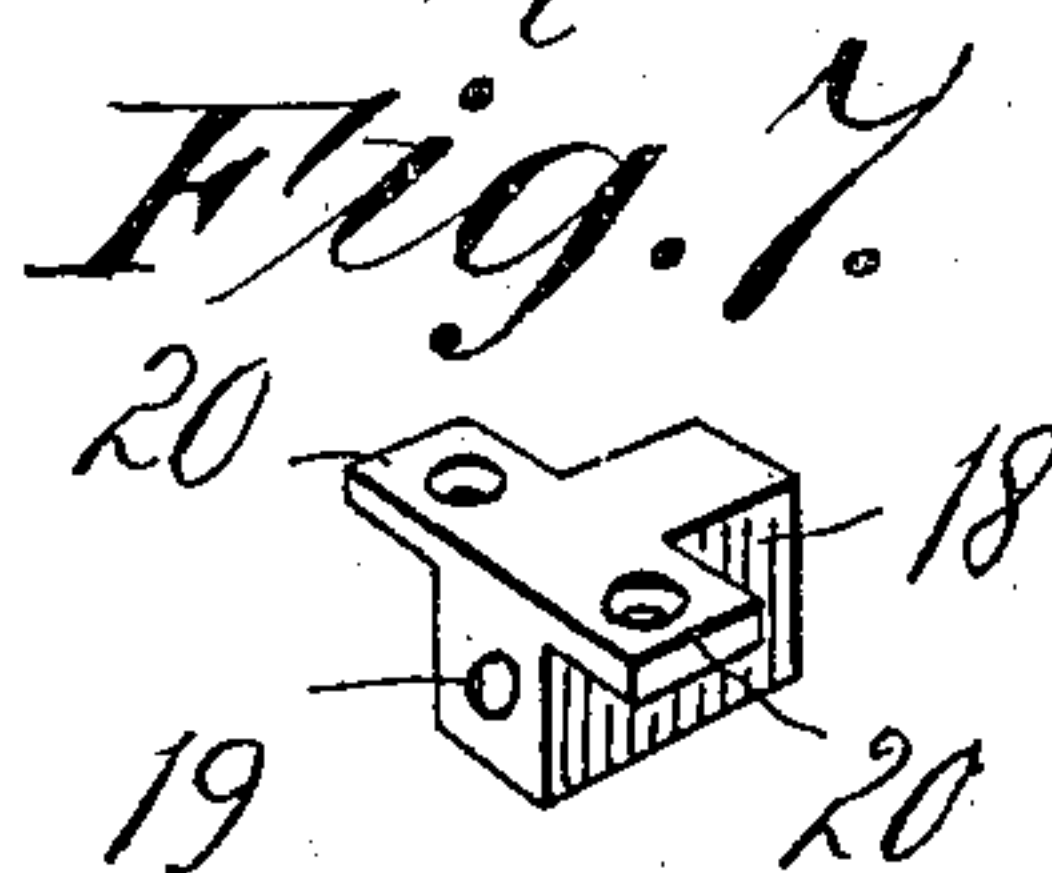
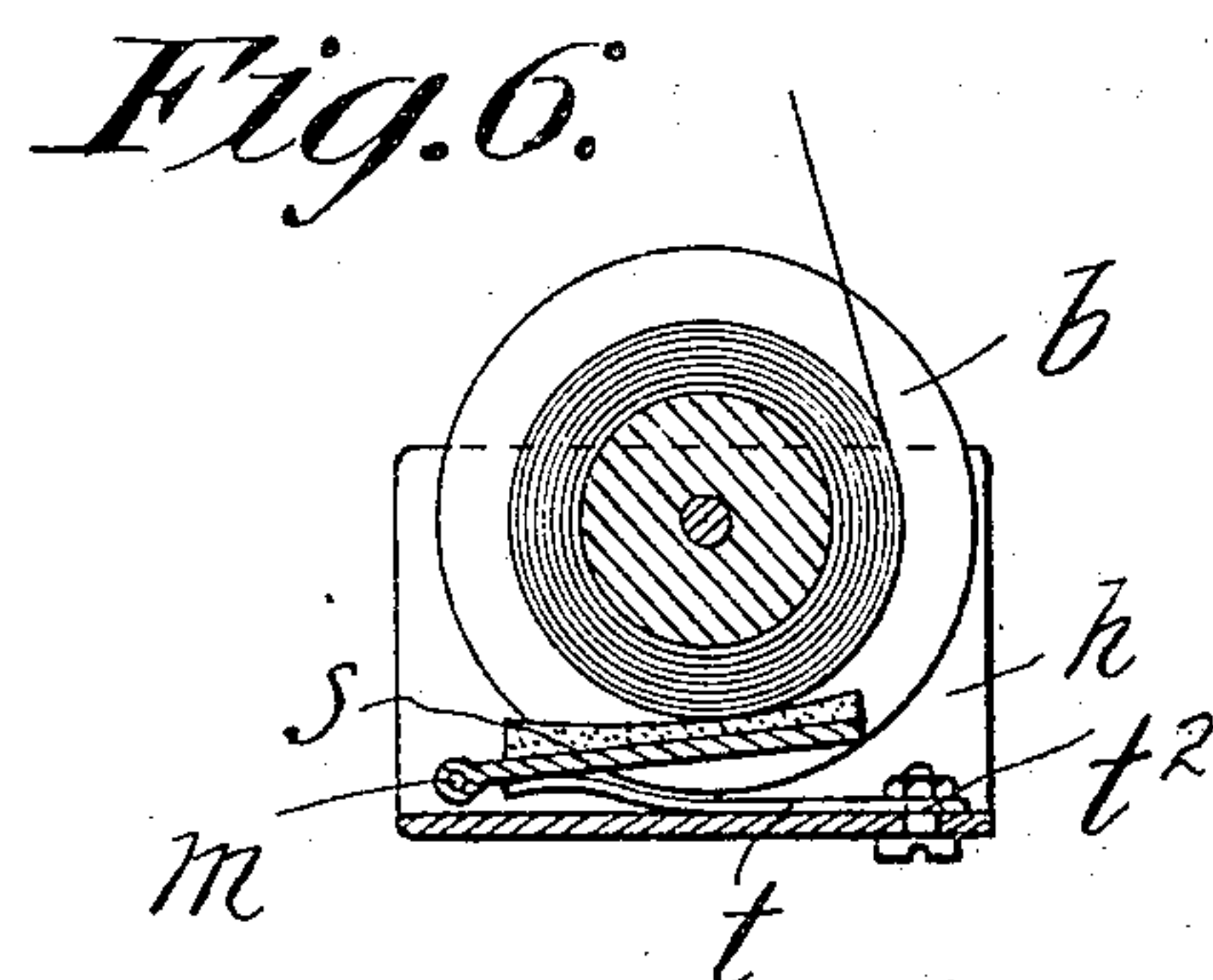
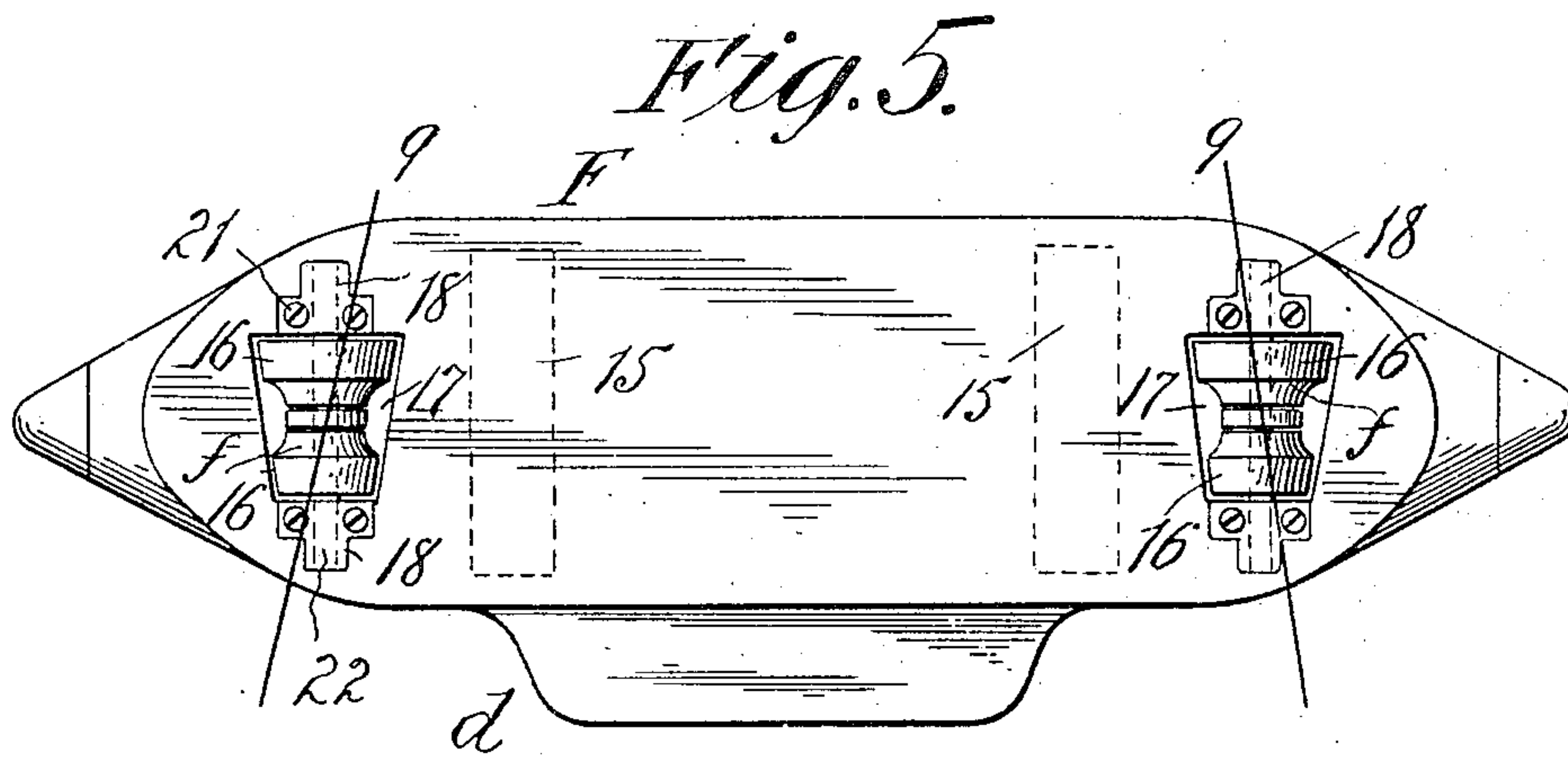
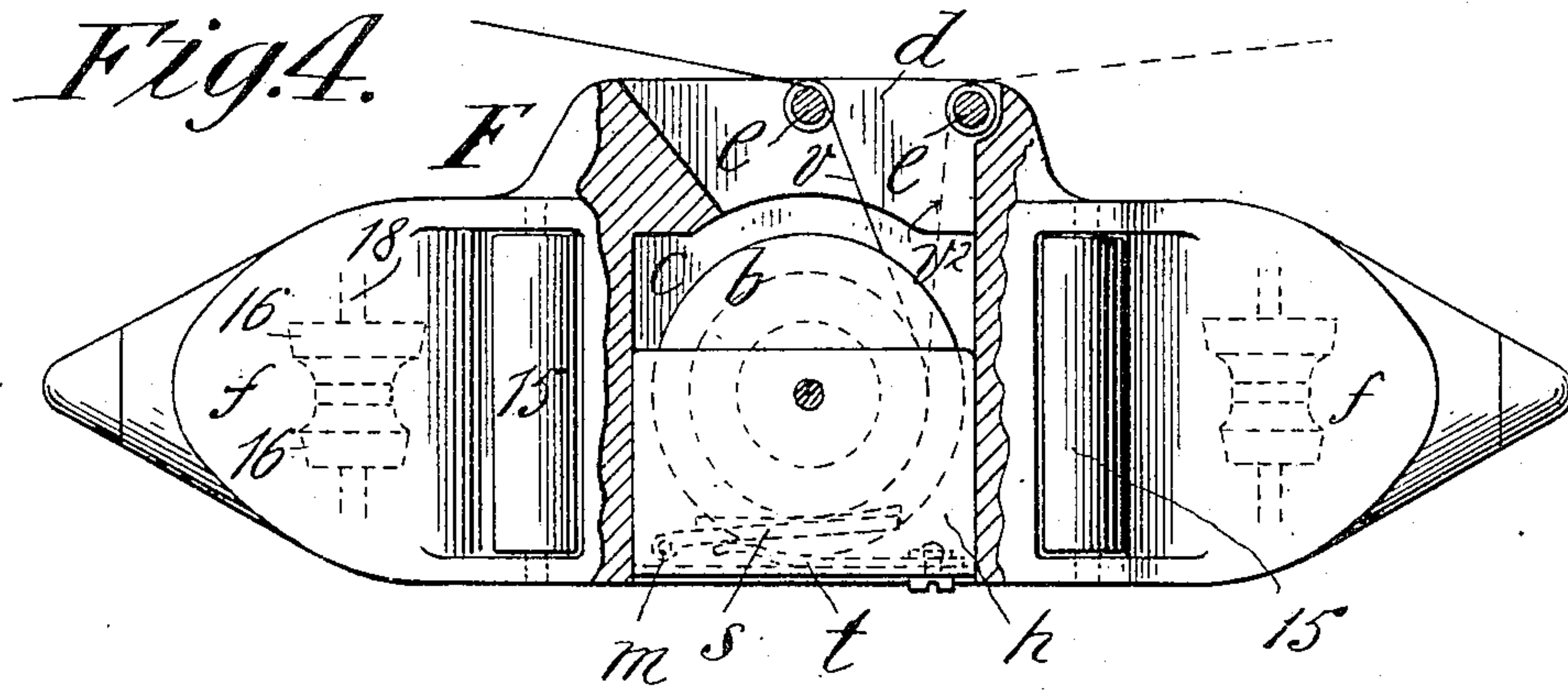
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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SHUTTLE FOR WIRE-LOOMS.

No. 808,430.

Specification of Letters Patent.

Patented Dec. 26, 1905.

Application filed July 18, 1904. Serial No. 217,024.

To all whom it may concern:

Be it known that I, HIRAM A. BOND, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Shuttles for Wire-Looms, of which the following is a full, clear, and exact description.

This invention relates to conjoint improvements in the shuttle and shuttle-carriage of a loom, which general description of shuttle and carriage is found in the well-known Lyall loom, wherein the shuttle-carriage connected to a flexible band or belt runs along on a trackway therefor on the lay-beam under the shed and the shuttle having rolls is supported and has its movements imparted thereto by the carriage, its location being within the shed, the shed changes or warp-wire crossings taking place after each traverse of the shuttle and its carriage and when the same are at either end of the lay-beam and outside of the warps.

The object of the present invention is to improve the shuttle and shuttle-carriage in respect of small but important features, whereby they become practicable and satisfactory for utilization in a loom of the class described in Letters Patent of the United States issued to me October 15, 1901, No. 684,536, and March 8, 1904, No. 754,192, and which loom is particularly designed for the weaving of a high grade of wire-cloth, such as is used in Fourdrinier paper-machines. In the weaving of such wire-cloth the wire employed is very fine, soft, or ductile, and delicate, easily stretched, kinked, or distorted, and it is therefore requisite that the combined shuttle and shuttle-carrier shall be so constructed for co-operation one with the other as to avoid injury to the warp-wires.

Under the provisions of the invention the shuttle will be kept truly and properly in its course across the loom and between the upper and lower divisions of the warps and without tendency to acquiring any improper change of direction.

Incidental to constructions it becomes practicable to operate the loom making an unusually low shed, so that the warp-wires will not become strained or stretched.

The invention consists in certain particular and peculiar features of constructions, forms of parts, and combinations of parts in the shuttle-carriage and the shuttle made with reference to its coöperation therewith,

all substantially as hereinafter described, and set forth in the claims.

In the drawings, Figure 1 is a side view of the shuttle and the shuttle-carriage represented as between a supporting runner-way and a bearing-bar, both appurtenant to the lay of the loom. Fig. 2 is a cross-section as taken on the line 2 2, Fig. 1. Fig. 3 is a perspective view of the shuttle-carriage and portions of the band connected to the opposite ends thereof. Fig. 4 is a plan view of the under side of the shuttle with the middle portion thereof broken away and in section showing the bobbin and bobbin-holder therein. Fig. 5 is a plan view of the top of the shuttle. Fig. 6 is a sectional view through the bobbin-holder and bobbin as taken on an intermediate plane thereof at right angles to the axis of the bobbin. Fig. 7 is a perspective view of one of the metallic journal-constituting fittings for the shuttle.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings, A represents a portion of the lay-beam of the loom, the same being equipped with the trough-shaped runner-way B for the shuttle-carriage C and having thereabove, forward of the reed *a* and carried at the under side of the reed-cap, the bearing-bar D, it being understood with reference to Fig. 2 that the battening is in the direction toward the letter *x*, *y* *y* representing the warp-wires making the shed, and F represents the shuttle supported by the carriage and so engaged therewith as to be drawn backwardly and forwardly thereby, the location of the shuttle being within the shed and having to roll over the lower set of warp-wires in its movements with the carriage, to which the back-and-forth movements may be imparted by novel means such as set forth and claimed in Letters Patent No. 785,655.

The carriage C, endwise connected with the band or belt 10, is made in the form of an approximately rectangular frame having within the aperture thereof the lower pair of rollers 12 12, extending slightly below the under surface of the carrier-frame to roll on the runner-way B, and the upper pair of rollers 14 14 in peripheral contact on the rollers 12 and acting as idlers for communicating rolling motions in the right directions to the pair of lower rollers 15 of the shuttle, these rollers being axially slightly nearer together than the pair of rollers 14 14 of the carriage, so as to be more or less nested and engaged there-

within, as represented in Fig. 1, for the usual communication of motion bodily to the shuttle by the carriage.

The shuttle has the rectangular cavity *c* therein for the bobbin-holder *h* and bobbin *b*, carried therein with the delivery-mouth *d*, in which are the grooved wire-guide rollers *e e*. The under side of the bearing-bar *D* is inclined downwardly and forwardly toward the beating-up point on an angle about corresponding to the inclination of the upper wires of the shed, and the upper side of the shuttle is correspondingly inclined, although the height of the shuttle is not such as to bring its top to contact with the under surface of the bearing-bar, the rollers *f f*, mounted within the upper part of the shuttle-body and near the ends thereof, having rolling contact against the inclined bearing-bar *D*. Each of these rollers regarded as a whole has its periphery beveled from end to end on an inclination corresponding to that of the under surface of the bearing-bar; but these rollers are made in opposite end halves or sections 16 16 to overcome liability which they might have in their rolling contact on the bar to divert the shuttle from its desired straight course, owing to the inequality in the diameters at different portions of the rollers.

The shuttle-body has at its end portions the apertures 17, at the opposite parallel ends of which are the inset journal-bearing blocks 18, the same having the alined journal-holes 19 and the perforated oppositely-offset ears 20, through which the screws 21 are passed to secure the blocks in the mortises therefor in the wooden shuttle-body.

The round journal rods or shafts 22 are extended into the holes 19 of the blocks or fittings 18, and the beveled roller-sections 16 16 turn on the shafts 22 independently of each other, and in actual practice in the mounting of these divided beveled roller-sections 16 16 on the shuttle-body they are arranged axially very slightly inclined from lines truly perpendicular to the longitudinal line of the bobbin. The degree of this angularity is so slight as to be imperceptible and not capable of observation in a drawing; but the inclinations of the axes are on trends indicated with great exaggeration by the lines 9 on Fig. 5 convergent toward the thicker or high side of the shuttle-body, and the axial inclination of one of the sectional beveled rollers may be slightly greater than that of the other to compensate for the difference of the draft or tension of the wire when drawn off toward different ends of the shuttle, as occurs on the reverse motions of the latter.

By arranging the sectional rolls slightly axially inclined to the true transverse line of the shuttle-body the shuttle has a tendency to "crawl" upwardly on the inclined surface of the bearing-bar toward the reed working, as it were, "up on a side hill" and nullifying

the tendency which the shuttle might more naturally have to settle laterally toward the beating-up point and become bound in the convergent space between the rollers 14 14 of the carriage and the under surface of the lay bearing-bar *D*. A further peculiarity in the action of the carriage and shuttle moving conjointly therewith is that the rolls 14 14 and 15 15 traverse all of the lower series of warp-wires in each crossing movement of the shuttle, and inasmuch as the carriage has considerable freedom or side lash in its runner-support *B* there is a constant vibration and slight changing between the adjacent pairs of rollers 14 and 15, especially in that they are not always strictly axially parallel, but there is a scissors-like working at their peripherally adjacent surfaces, the tendency of which near their central parts is to nip and kink or distort more or less of the warp-wires, across and at opposite sides of which the rolls move, and in order that such result may be obviated one of each of the adjoining rollers 14 15 has a central recess or rabbet, as represented at 30, the recessed rollers in the illustrations here given being the idler-rollers 14 of the carriage, although the under rollers 15 of the shuttle might be the ones intermediately rabbeted for acquiring the same effect.

The bobbin *b*, as seen in Fig. 2, is in the form of a flat spool having the end flanges or heads, and the same is set within and carried for its rotation by the bobbin-holder *h*, which is in the form of a sheet-metal U-shaped strap having dimensions to be crowded into the shuttle-aperture *c* and frictionally held therein by the elasticity of the side members of the holder, and the wire may run in the courses represented by the full line and dotted line, Fig. 4, and, as guided by the grooved rollers *e e*, accordingly as to whether the shuttle is moving to the right or to the left across the loom in the shed. Located within the bobbin-holder is a shoe *s*, pivotally connected to and between the sides of the holder, as indicated at *m*, said shoe being arranged to swing against the convolutions of the wire wound on the core or central body of the bobbin and to be held with yielding pressure by the spring *t*, one end of which is fastened, as indicated at *t*², to the back or uniting member of the holder. The spring is under the greatest compression when the bobbin is full, such compression and tension lessening, as it is desired that it should, as the wire is used off therefrom. The bobbin is heaviest and will acquire more momentum for rotation when full than when the supply is diminished, and consequently the spring-pressure counteracts the difference in momentum, giving practical equality of wire-delivery.

With reference to Fig. 4 it will be seen that when the wire runs off at the angle of the full line *v* its withdrawal is under some-

what more tension than when the strain is on the different tangent line represented by the dotted line v^2 , which shows the course of the wire when the shuttle is moving in the other direction, the variations having tendencies to variably change the degree of divergencies of the shuttle laterally from its required course across the loom and through the shed, and these variable tendencies to such deflections are provided against or rectified by the slight angularity in the setting of the axes of the beveled sectional rollers 16 16, the inclination of the axis-line of the left-hand sectional roller being somewhat greater than the inclination for the right-hand roller, but the inclinations of both being so slight as to be imperceptible, and the indication thereof is only relied on in the drawings by 9 9, Fig. 5.

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

1. The combination with the lay-beam having a runner-way and a shuttle-carriage movable therein, having peripherally-contacting pairs of rolls axially transverse of the length of the carriage, said beam having a bar above the runner-way with its under surface inclining downwardly from its rear to its front edge, of the shuttle having a body provided with rolls at its under side arranged to coact with and adjoin within the upper pair rolls of the carriage, and having at its upper side rolls in paired, axially-alined, separate, independently - rotatable sections having their peripheries beveled to correspond with the inclination of the aforesaid bar of the lay-beam.

2. The combination with the lay-beam having a runner-way and a bar above said way having its under surface inclining downwardly from its rear to its front edge, and a shuttle-carriage movable in the way, of a shuttle operated by the carriage, said shuttle having at its upper side, rolls in paired, axially-alined, separate, independently-rotatable sections whose peripheries are beveled to correspond with the inclination of the aforesaid bar of the lay-beam.

3. The combination with the shuttle-carriage having rolls in pairs axially transverse of the length of the carriage and in peripheral contact, and a runner-way on the lay for the carriage and a bearing-bar on the lay above the runner-way, having its under surface inclined downwardly from its rear to its forward edge, of the shuttle having in the under part of the body thereof a pair of rolls axially parallel on lines transverse of said body, and arranged for disposition within and adjoining the upper rolls of the carriage, one set of said adjoining rolls being centrally peripherally rabbeted, and rolls at the upper portion of the shuttle-body composed of axially-alined, separate, independently-rotatable sections having their peripheries beveled to correspond with the inclination of the said bearing-bar of the lay.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

HIRAM A. BOND.

Witnesses:

A. V. LEAHY,
WM. S. BELLOWES.