

W. STAFFORD & R. C. HOLT.  
DIAL KNITTING MACHINE.

APPLICATION FILED OCT 6, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

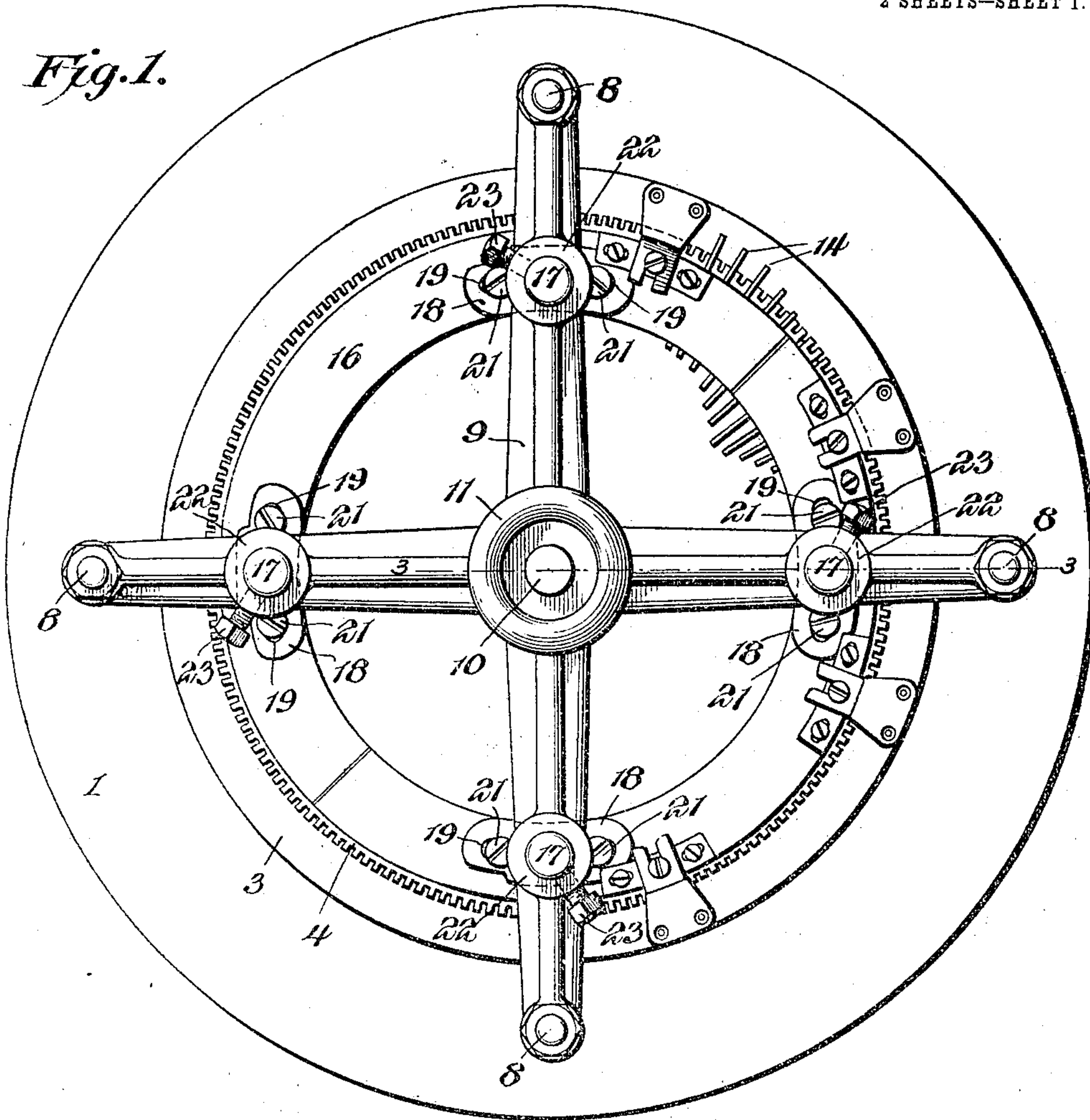
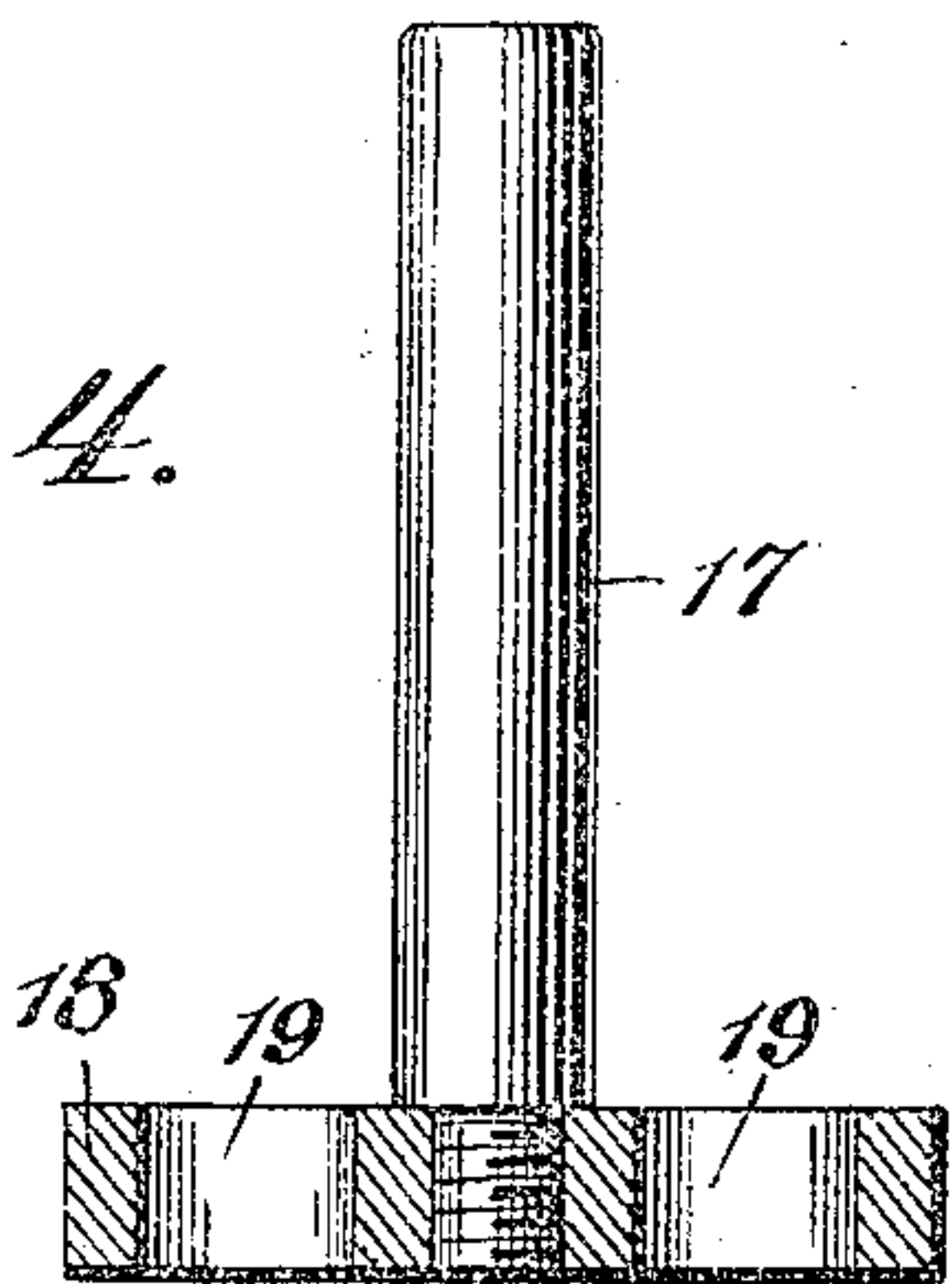
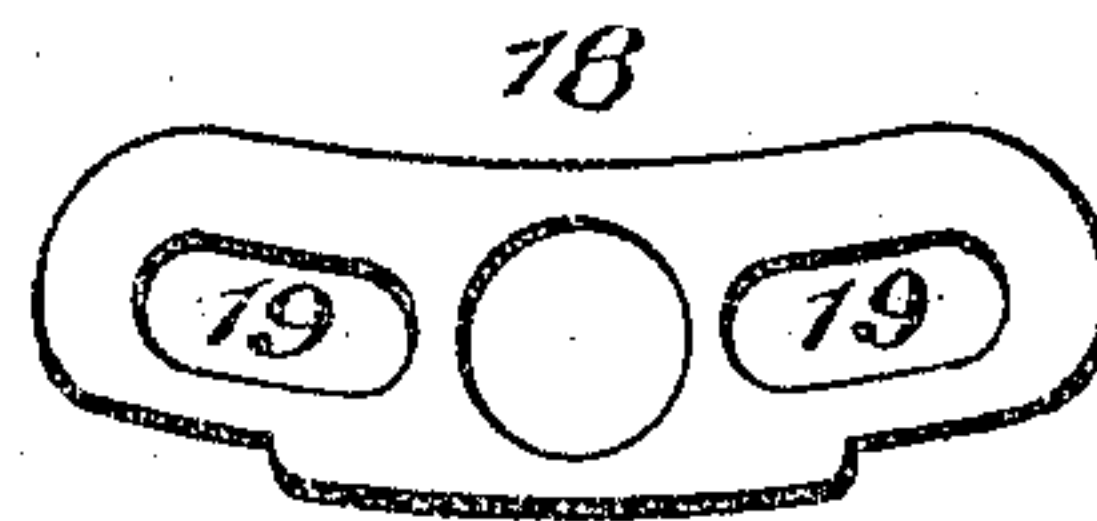


Fig. 4.



Witnesses  
Howard D. Orr.  
Louis G. Juhn

Fig. 5.



Walter Stafford  
and R. C. Holt, Inventors,

By

E. G. Siggers  
Attorneys

W. STAFFORD & R. C. HOLT.  
DIAL KNITTING MACHINE.

APPLICATION FILED OCT. 6, 1904.

2 SHEETS—SHEET 2.

Fig. 2.

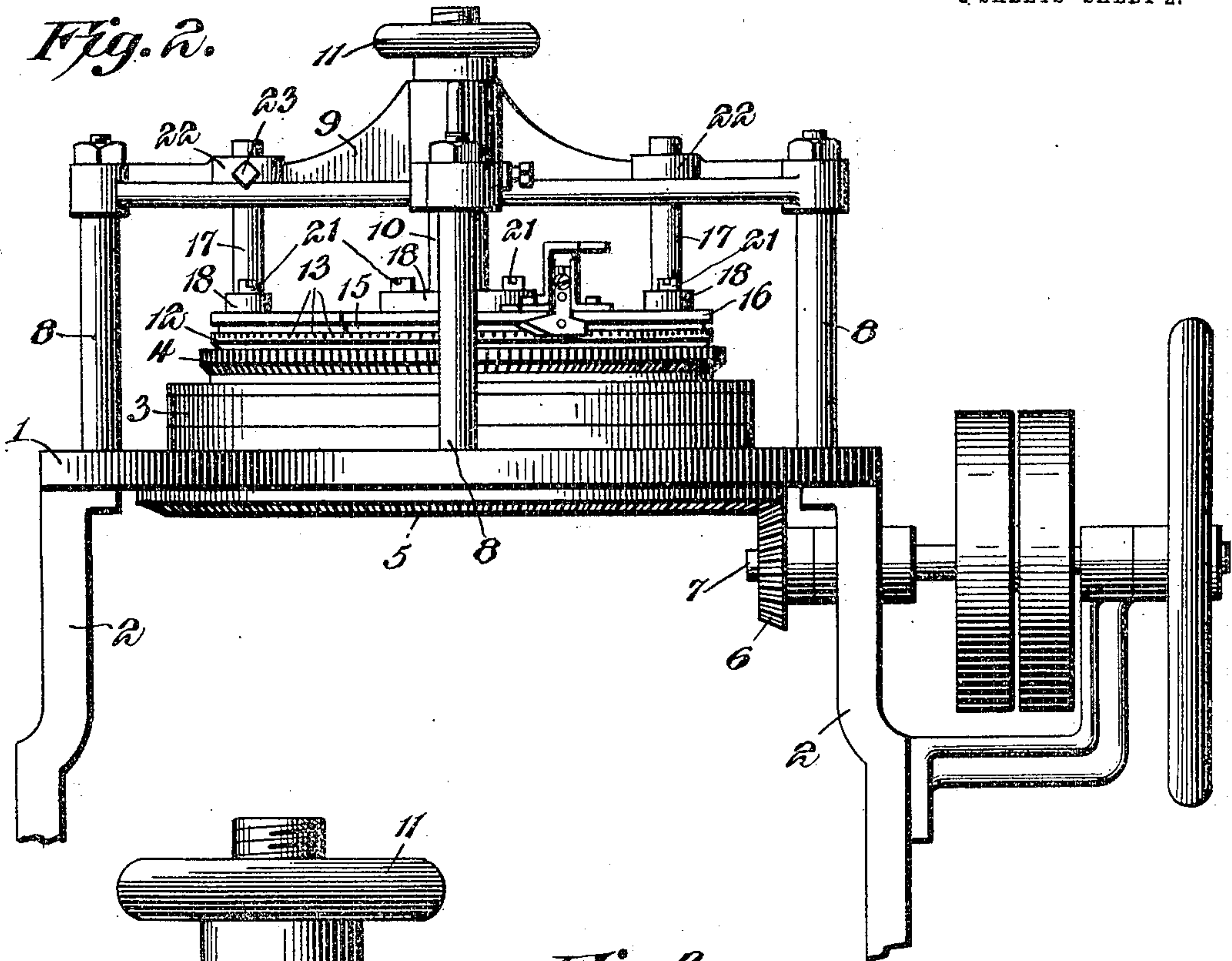
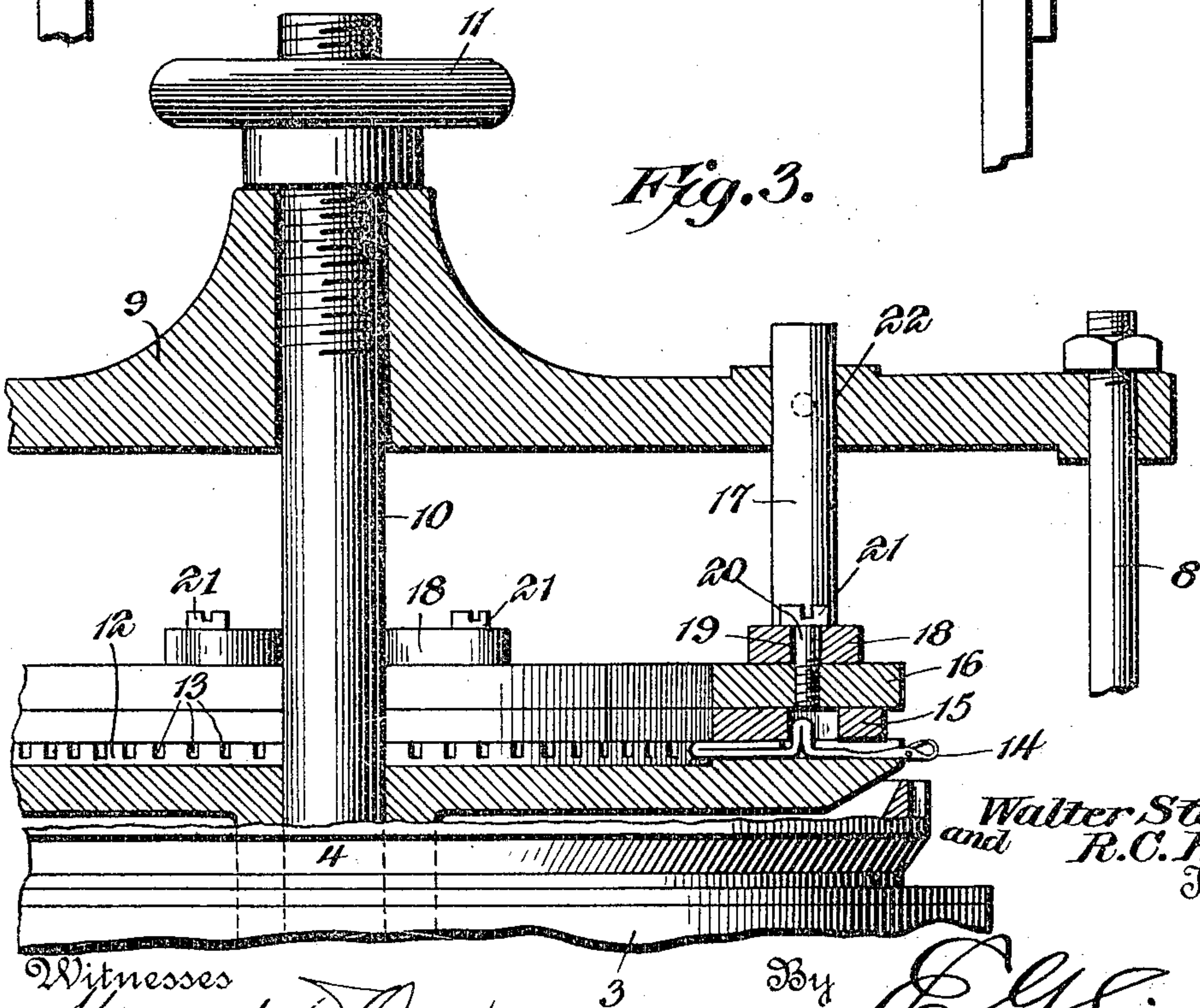


Fig. 3.



Walter Stafford  
and R.C. Holt,  
Inventors,

Witnesses

Howard W. Orr.  
Rue G. Julien

By

E. J. Siggers.  
Attorneys



# UNITED STATES PATENT OFFICE.

WALTER STAFFORD AND ROBERT CHRISTOPHER HOLT, OF LITTLEFALLS,  
NEW YORK.

## DIAL KNITTING-MACHINE.

No. 808,121.

Specification of Letters Patent.

Patented Dec. 26, 1905.

Application filed October 6, 1904. Serial No. 227,492.

*To all whom it may concern:*

Be it known that we, WALTER STAFFORD and ROBERT CHRISTOPHER HOLT, citizens of the United States, residing at Littlefalls, in the county of Herkimer and State of New York, have invented a new and useful Dial Knitting-Machine, of which the following is a specification.

This invention relates to a novel knitting-machine of that type known as "circular-rib" machines and characterized by needles arranged in horizontal and vertical series and operated by fixed cams as the series of needles are moved with a vertical needle-cylinder and a horizontal needle-dial. In machines of this type it is usual to provide a fixed bed-plate carrying a rigid dial-arch, from which is suspended a vertical non-rotary dial-shaft carrying at a point below the arch a rotary needle-dial which supports the horizontal needles. Above the needle-dial is a dial-cam disk secured to the dial-shaft and carrying on its under face cams which cooperate with the needle-butts to effect the reciprocation of the needles as the dial rotates. While this type of knitting-machines is generally efficient, it embraces a number of objectionable characteristics. Prominent among these is a tendency on the part of the dial and dial-cam plate to be forced apart, which is especially noticeable when slight irregularity is induced by the wearing of the dial-bearing. This tendency after slight wear of the parts prevents the dial from running truly in a horizontal plane and results in a variation of the relative length of the stitches, which necessarily results in corresponding variations in the fabric, the effect of which is cumulative until one side of the fabric is destroyed by being pulled full of holes, while the tension on the other side is insufficient to clear the thread from the needles. Aside from this serious defect these machines are liable to frequent "smashes," by which is meant the wedging and consequent destruction of a series of needles and frequently also the injury of the needle bed or dial. Furthermore, the reciprocation of the needles forces a considerable amount of the "flyings" or waste from the yarn, together with fragments of broken needles and other foreign substances, back into the spaces behind the cams and between the dial and the dial-cam disk. The accumulation of this

debris eventually presents sufficient resistance to stop the machine, the top of which must be dismantled in order to remove the dial-cam plate, and thus gain access to the accumulated dirt and needles for the purpose of inspection and repair. It has been proposed to render the needles and the needle-grooves in the dial more readily accessible without removing the dial-plate by cutting out the center of the plate or disk and removably connecting the cams with the under side of the plate in a manner to permit their withdrawal through the central opening or cut-out portion of the plate. While this proposed change facilitates access to the needles and grooves, as well as the withdrawal of the debris accumulated upon the dial adjacent to the dial-shaft, the tendency of the dial and its cam-plate to wedge apart, and thus endanger the integrity of the needles and the uniformity of the fabric, is rather increased than diminished, for the reason that the dial-plate is still supported from the dial-shaft in the proposed construction by a cross bar or bridge extending diametrically across the central opening in the dial-plate and detachably secured to the latter.

The object of our invention is to facilitate the inspection of both ends of the needles and the removal of debris from the dial-plate and to reduce to a minimum the irregularities in the fabric and the liability of breaking the needles, these ends being attained by providing an annular dial-plate with a support entirely independent of the dial and dial-shaft and so arranged that the space located above the dial and circumscribed by the dial-cam plate will be totally unobstructed except by the dial shaft and arch.

Considered in a subordinate aspect, a further object of the invention is to mount the dial and the dial-cam plate upon independent supports each of which is vertically adjustable, so that while the dial and plate can be adjusted with facility to accurately position the parts in setting up the machine the cam-plate can be thereafter adjusted and set rigidly to cause the needle-dial to remain in contact with it even after the bearing of the dial has become worn.

A still further object of the invention is to secure a maximum rigidity of the dial-cam plate by providing therefor supporting members at a plurality of separated points, over-



coming the tendency to vibrate which is possessed by a centrally-supported disk or plate.

Another object is to construct the dial-cam plate in sections which may be separately manipulated to facilitate repair.

To the accomplishment of the several objects stated and others which will hereinafter more fully appear the preferred embodiment of the invention resides in the construction and arrangement of parts to be herein described, illustrated in the accompanying drawings, and succinctly defined in the appended claims.

In said drawings, Figure 1 is a plan view of a knitting-machine constructed in accordance with our invention. Fig. 2 is a side elevation of the machine with the lower portion of the supporting-frame broken away. Fig. 3 is a sectional view on the line 3 3 of Fig. 1 with certain parts in elevation and others broken away. Fig. 4 is a detail view of one of the dial-cam-plate supports, and Fig. 5 is a bottom plan view of the construction shown in Fig. 4.

Like numerals are employed to designate corresponding parts throughout the views.

1 indicates the base-plate of a circular-rib-knitting machine of a well-known type carried by a standard 2 and supporting the cam-ring 3, which carries the operating-cams for the vertical needles. Within the ring 3 is mounted to rotate the needle-cylinder 4, which carries the vertical needles (not shown) and is provided in its under side with a large gear-wheel 5, driven by a pinion 6, mounted on a driving-shaft 7, to which power is applied in any suitable manner. Rising from the base-plate 1 are the four standards 8 of the dial-arch 9, from the center of which depends the dial-shaft 10. The shaft 10 is designed to be adjusted vertically by a hand-wheel 11, screwed thereon above the arch and arranged to be rotated for the purpose of raising or lowering the needle-dial 12, rotatably mounted on the dial-shaft 10. The needle-dial 12 is in the form of a disk provided in its upper face adjacent to its periphery with a series of needle grooves or ways 13, in which reciprocate the horizontal needles 14, which cooperate with the vertical needles in a manner well understood in the art. As the needle-dial 12 rotates the needles 14 are reciprocated by relatively fixed cams 15, secured to the under side of an annular dial-cam plate 16, which may be continuous or formed in separate segments, as desired, but preferably the latter, as illustrated.

By making the plate 16 of annular form, as shown, the upper surface of the needle-dial 12, exclusive of that portion thereof which is covered by the cams 16, is accessible from above, so that any flyings, pieces of broken needles, or other debris carried inward by the horizontal needles in their operation can be

easily removed or the needles inspected from either end without interfering with the operation of the machine. As heretofore stated, it is essential to the proper operation of the machine that the dial 12 be constantly maintained in a true horizontal plane, as the fabric will otherwise lack the requisite uniformity. In consequence of the variation of the tension in machines of usual construction this maintenance of the parts in their proper planes of movement has been practically impossible, particularly after the bearings have become slightly worn, for the reason that the operation of the needles tends to force the dial and dial-cam plate apart, and as the dial-cam plate has usually been provided with a single central support it has lacked the necessary rigidity and has yielded more or less to the force exerted thereon adjacent to its outer edge by the needles. This relative yielding of the dial and dial-cam plate has naturally resulted in the binding of certain of the needles, causing irregularities in the operation of the machine and the frequent breaking of a needle or series of needles. To avoid these defects, the present invention is directed not only to the equipment of the machine with an annular dial-cam plate, which facilitates inspection, cleaning, and repair, but also contemplates a rigid support for the dial-cam plate independent of the dial and of the dial-shaft and at a plurality of points located with special reference to the resistance of the force exerted in an upward direction by the needles.

In the present embodiment of the invention the supporting means for the dial-cam plate includes a plurality of vertically-disposed stems 17, each provided at its lower end with a foot 18, having the form of a plate imposed upon the dial-cam plate and provided with a pair of slots 19 for the reception of bolts 20, screwed into the plates 16 and having heads 21, which serve to securely retain the foot 18 in rigid engagement with the dial-cam plate after the stem has been properly positioned relative thereto. The stems 17 extend forwardly through sockets 22 in the dial-arch 9 and are adjustably retained by set-screws 23, as shown. By means of the stems 17 the dial-cam plate is supported directly from the dial-arch instead of from the dial-shaft, as is usual, and it will therefore be seen, first, that the plate is supported independently of the dial or its shaft; second, that the plate is provided with peripheral instead of a central support; third, that said plate is supported at a plurality of points instead of at a single point, as usual, and, fourth, that the plate-supporting means engages the plate opposite the needles, so as to directly oppose the upward thrust exerted on the plate by the latter. It will be noted, furthermore, that by reason of this peculiar mounting of the dial-cam plate access to the central



portion of the dial where the debris accumulates is wholly unobstructed by the dial-cam plate or any part of its supporting structure except the dial-arch. Attention may also be directed to the fact that while the supports for the dial and the dial-cam plate are independent the dial and plate may nevertheless be adjusted vertically and in unison by the manipulation of the hand-wheel 11 in the ordinary manner. To do this, it is simply necessary to loosen the set-screws 23, when, as will be evident, the stems 17 will slide freely in the dial-arch, and the dial and plate may therefore be raised or lowered in unison by rotating the wheel 11 in the proper direction, and thus raising or lowering the dial-shaft 10. When the proper adjustment has been effected, the set-screws 10 are tightened and the dial-cam plate is rigidly supported independently of the dial. When access to the needle grooves or cams 15 is desired for purposes of repair, the set-screws 23 may be loosened and the plate 16 raised to separate the plate and dial, and thus render the needle grooves and cams accessible without removing the latter from the dial-cam plate. Instead, however, of elevating the plate in the manner described the same result can be attained by first loosening the screws 23, then raising the dial and plate by the manipulation of the wheel 11, and then after tightening the screws to cause the retention of the plate in its elevated position the dial may be again lowered by the manipulation of the wheel 11 to separate the parts for the purpose stated.

It will of course be understood that while we have shown the dial-cam plate supported from the dial-arch, since this is a simple and convenient arrangement, the invention comprehends, broadly, the idea of rigidly supporting the dial-cam plate independently of the dial or its shaft, and it is therefore within the purview of the invention to form the plate-supports in any other manner and to effect their attachment to the base-plate or any other convenient part of the machine instead of to the arch, as shown. Attention is also directed to the fact that each section or segment of the dial-cam plate is separately supported by a pair of stems 17, although obviously the number of segments may be increased and each may be supported by a single stem or as many more as desired.

It is thought that from the foregoing the description and operation of our machine and the advantages accruing from the use of the novel construction shown will be clearly comprehended; but while the structure shown and described is thought at this time to be preferable we desire to be distinctly understood as reserving the right to effect such changes, modifications, or variations thereof as may come fairly within the scope of the protection prayed.

What we claim is—

1. In a dial knitting-machine, the combination with a dial-arch, a vertical dial-shaft, and a needle-dial journaled on the shaft, of a dial-cam plate disposed over the dial and having an open center through which the upper surface of the dial is accessible, the space defined above and below by the arch and dial respectively and at its inner and outer sides by the shaft and cam-plate, being entirely unobstructed, and means for supporting the dial-cam plate from the arch independently of the shaft.

2. In a dial knitting-machine, the combination with a dial-arch, a vertical shaft, and a needle-dial, of a dial-cam plate having an open center through which the upper surface of the dial is accessible, and supporting means for the dial-cam plate located wholly outside of and beyond the open center thereof, whereby the space defined above and below by the arch and dial respectively and at its inner and outer sides by the shaft and cam-plate is wholly unobstructed.

3. In a dial knitting-machine, the combination with a dial-arch, a vertical dial-shaft, and a needle-dial, of a dial-cam plate disposed above the dial and having an open center through which the upper surface of the dial is accessible, and supporting means for the dial-cam plate including a plurality of stems extending vertically from the plate and having connection with the arch.

4. In a knitting-machine, the combination with a base-plate and a surmounting dial-arch, of a dial-shaft depending from the arch, a needle-dial journaled on the dial-shaft, means for effecting the vertical adjustment of the dial-shaft to raise and lower the dial, an annular dial-cam plate disposed over the dial adjacent to its periphery, and supporting means for the dial-cam plate including a plurality of stems extending vertically from the plate and having adjustable connection with the arch.

5. In a knitting-machine, the combination with a rigid frame structure, a dial-shaft, and a dial, of a dial-cam plate disposed above the dial, and a support for said plate, said support having adjustable connection with the plate and frame structure respectively.

6. In a dial knitting-machine, the combination with a dial-arch, a dial-shaft, and a dial, of a dial-cam plate disposed above the dial, and a vertically-disposed supporting member having vertically-adjustable connection with the arch and also having horizontally-adjustable connection with the dial-cam plate.

7. In a dial knitting-machine, the combination with a dial-arch, a dial-shaft, and a needle-dial, of a dial-cam plate disposed above the dial, a plurality of vertically-disposed stems each having adjustable connection



with the dial-arch, and a foot carried by the lower end of each stem and adjustably connected with the dial-plate.

8. In a dial knitting-machine, the combination with a dial-arch, a dial-shaft, and a needle-dial, of a dial-cam plate located above the dial, and supporting means for said plate including a stem passed through the arch and adjustably retained thereby, a slotted foot at the lower end of the stem, and screws passed through the slotted foot and engaging the dial-cam plate.

9. In a knitting-machine, the combination with a frame structure and a needle-dial, of a dial-cam plate composed of separate sections, and independent supporting means for each of said sections.

10. In a dial knitting-machine, the combination with a dial-frame structure and a needle-dial, of a dial-cam plate composed of separate sections, and supporting means arranged to permit one of said sections to be independently raised and supported in an elevated position to facilitate access to the needle-dial.

11. In a knitting-machine, the combination with a rigid frame structure, a needle-dial and needles, of an annular dial-cam plate composed of arcuate sections, and independent supporting means for said sections.

12. In a knitting-machine, the combination with a rigid frame structure, a dial-shaft suspended therefrom, and a needle-dial sup-

ported by said shaft, of an annular dial-cam plate composed of separate arcuate sections, means for supporting said sections independently of each other and of the dial-shaft, and needle-cams carried by the dial-cam plate.

13. In a dial knitting-machine, the combination with a needle-dial, of a dial-cam plate mounted above the dial and including a separate arcuate section and a vertical supporting-stem for said section.

14. In a dial knitting-machine, the combination with a dial-arch, a dial-shaft, and a needle-dial, of a dial-cam plate disposed above the dial and including an independently-movable arcuate section, and means for adjustably supporting said section from the dial-arch independently of the dial-shaft.

15. In a dial knitting-machine, the combination with a dial-arch, a dial-shaft, and a needle-dial, of a dial-cam plate disposed above the dial and including a separate arcuate section and a vertical supporting-stem extending from and adjustably mounted in the arch and movable to elevate the separate section of the dial-cam plate.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

WALTER STAFFORD.

ROBERT CHRISTOPHER HOLT.

Witnesses:

FREDERICK C. FOX,  
R. E. FAILING.