

(No Model.)

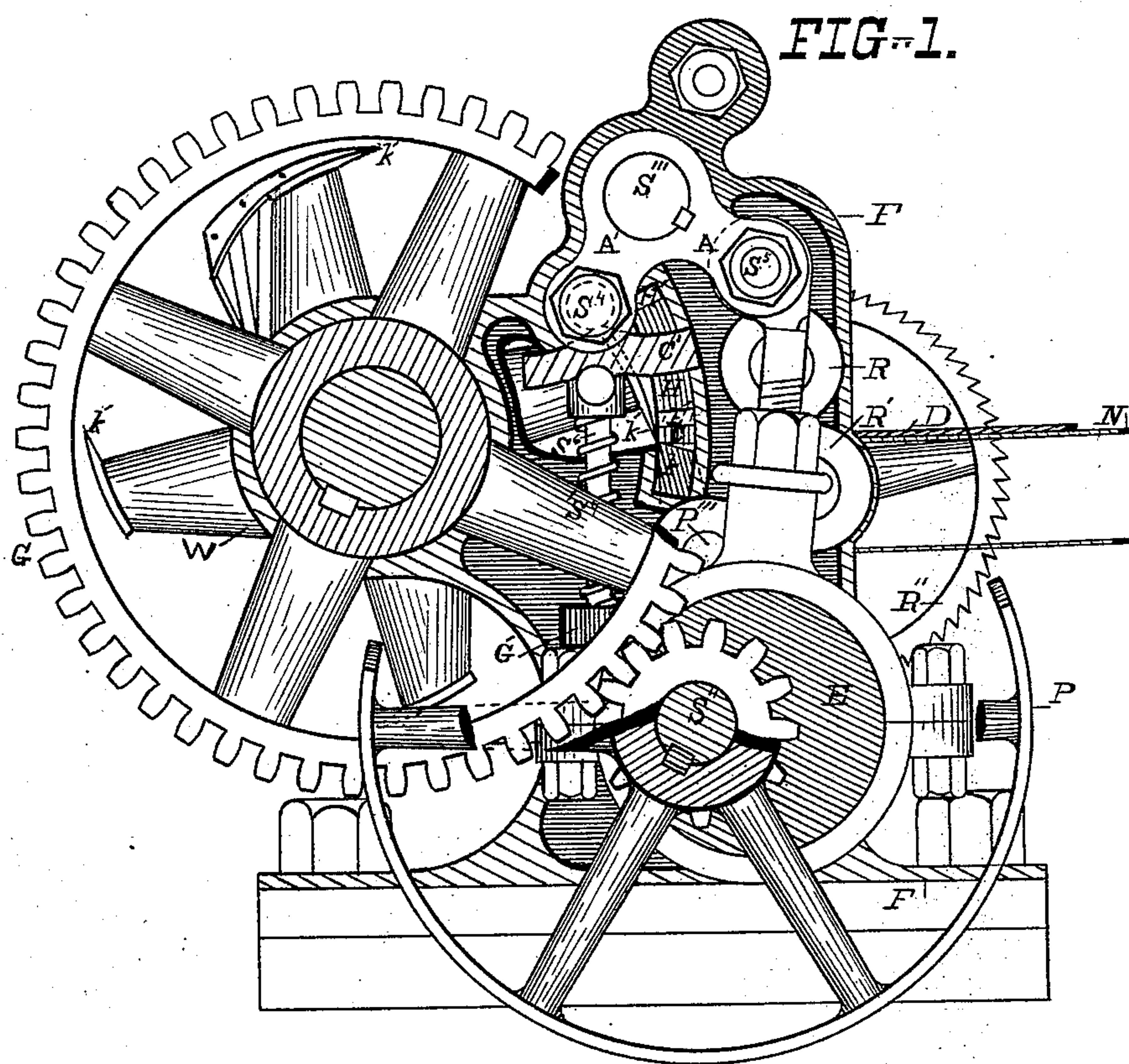
3 Sheets—Sheet 1.

J. R. FRANCE.

COTTON FIBER DUST AND PREPARING THE SAME.

No. 420,447.

Patented Feb. 4, 1890.



WITNESSES.

William H. Willis Jr.  
William Stevens.

INVENTOR.

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atty.

(No Model.)

3 Sheets—Sheet 2.

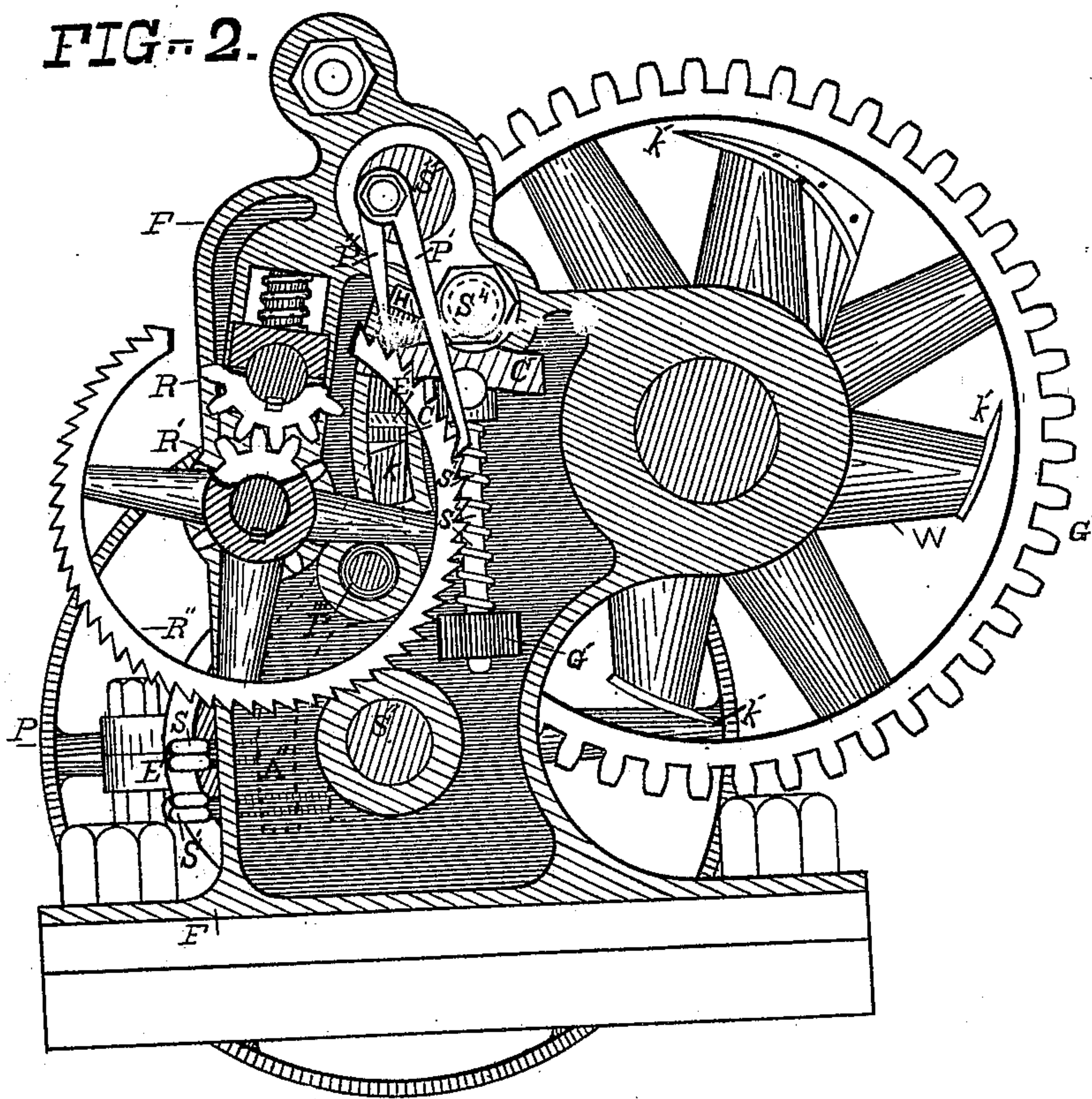
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FIG. 2.



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(No Model.)

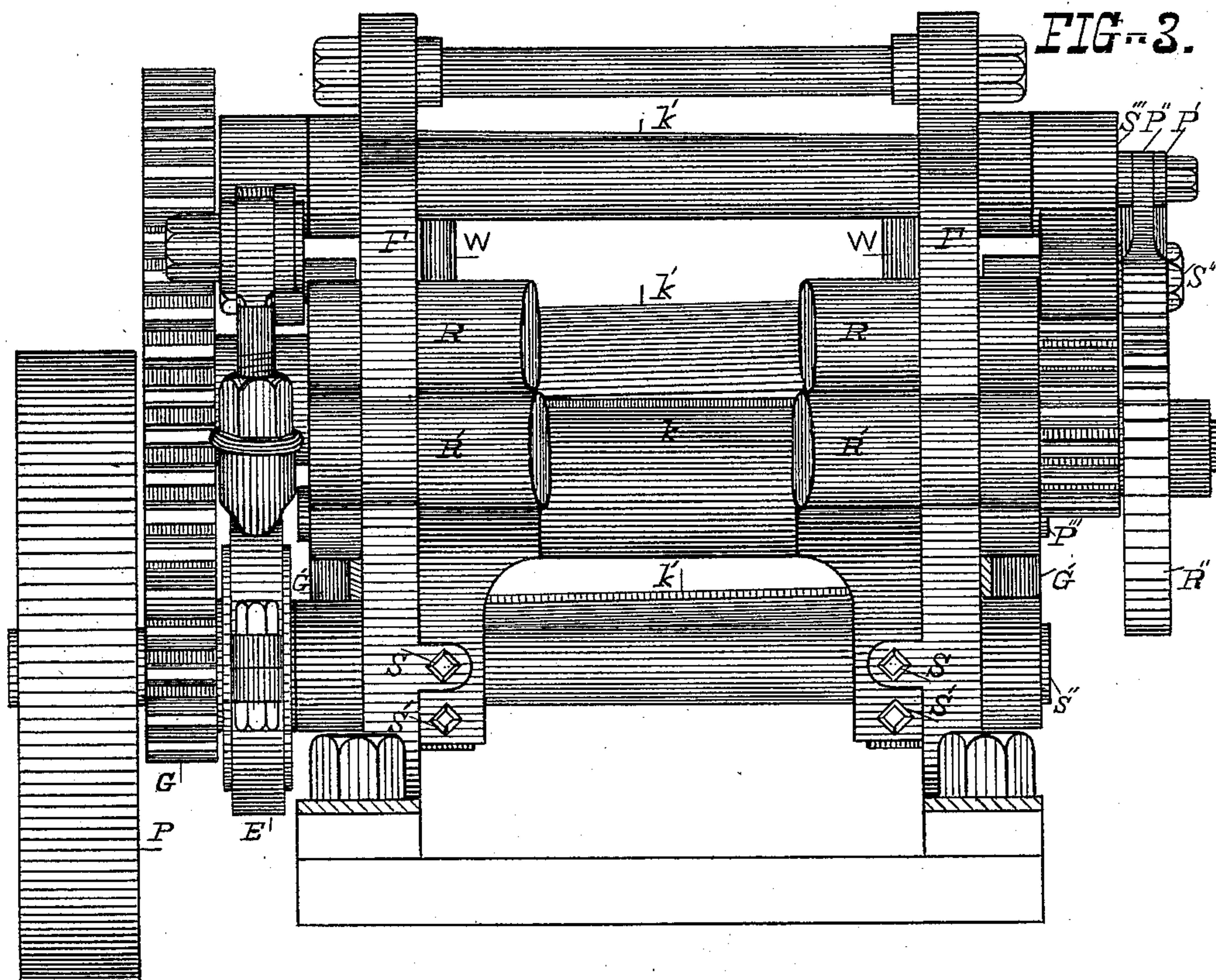
3 Sheets—Sheet 3.

J. R. FRANCE.

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WITNESSES.

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# UNITED STATES PATENT OFFICE.

JOSEPH R. FRANCE, OF NEW YORK, N. Y.

## COTTON-FIBER DUST AND PREPARING THE SAME.

SPECIFICATION forming part of Letters Patent No. 420,447, dated February 4, 1890.

Application filed January 21, 1888. Serial No. 119,845. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH R. FRANCE, a citizen of the United States, residing in the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in the process of preparing cotton fiber as a base for the manufacture of nitro-cellulose, and also in the product produced thereby.

For this invention I have received no Letters Patent whatever.

The following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a process by which the cotton fiber may be carded, combed, or disposed in the form of a card or lap having the fibers arranged therein longitudinally instead of being irregularly or to some extent transversely disposed, the card or lap to be subsequently fed or offered to the action of a knife or knives cutting across the lap or card by such short stops or stages that at each cut of the knife the approximate ends of the fibers will be cut off in extremely short lengths or particles, and so as to present substantially the appearance of cotton-dust made from the fiber.

It also relates to the product or article produced thereby.

The process and the product above stated are accomplished and obtained by means of the mechanism illustrated in the accompanying drawings, and described herein, in which—

Figures 1 and 2 are opposite end views of the cutting-machine, and Fig. 3 is a rear view with some of the parts removed to show other parts.

Similar letters represent similar parts throughout the several figures.

It has heretofore been customary to cut old rope into short lengths for treatment preparatory to or in the early stages of paper-making. The object of this operation is to get the material into manageable lengths for manipulation in the engines. It has, however, so far as I am aware, been hitherto supposed that cotton, when brought by whatever means to a similar state as to length and size of fiber, required no further mechanical ma-

nipulation to prepare it for the treatment required to nitrate the same. At the same time there has been well-recognized difficulty and uncertainty in realizing the theoretical or expected results when treating cotton fibers, which have been attributed to variation of strength and to other faults in the chemicals, and also to still other causes. I have discovered that these difficulties and uncertainties are due largely, if not entirely, to obstruction in the fiber itself, when it is used in its natural state and length of growth, and in the longer fibers when cut or reduced in length to an insufficient degree. I have also discovered that when reduced to a finely-divided state by chemical means, preparatory to further treatment, as for the formation of nitro-cellulose, the chemicals used for that purpose themselves present new obstructions to further chemical action, and consequently do not furnish a remedy.

My explanations are that the cotton and other vegetable fibers have for their protection a glazed surface, as it were enameled by nature; that they are tubular and cellular in structure and are provided with a natural lubricating semi-fluid characteristic oil, gum, or other material, or a combination of such substances; that these tubes in their natural state and length are open at one end only, and in that condition, as also when cut and open at both ends, but of some length, present a line or route of least resistance to chemical access and action by way of the inside of the tubular part of the structure; that such access is effected, in part, at least, by capillary attraction, which is to an increasing extent resisted and counterbalanced by the air or other contents of the tubes as it proceeds, and is finally arrested, while the chemicals are themselves subject to change as they progress, and therefore to a modification of their natural action on the substance of the fiber; and, finally, that most, if not all, of these elements of obstruction vary in different samples of cotton and other vegetable fiber grown on different soils, in different climates, and under other varying conditions to such an extent that these variations defy anticipation and remedy when the fiber of natural length, or only partially shortened, is treated in the



ordinary way, however uniform the acids used may be in strength and proportions, and however carefully the manipulations may be conducted, the final result being a product which is not completely and uniformly changed by or in the chemical action. I meet and overcome these difficulties by cutting, pulverizing, grinding, or otherwise reducing cotton fiber to as great an extent as possible, even to a dust, by mechanical means preparatory to any treatment by chemicals. The principle of this part of my invention is that the glaze is broken up or disturbed mechanically, and thereby allows external access when subjected to chemicals in subsequent treatments; that the number of openings of the tubes is doubled every time a length of fiber is cut until capillary obstruction is neutralized or obviated in all samples of cotton, and that uniformity of result is obtained in all chemical action thereon, because all parts of the mass are reached and acted upon at or about the same time and before the acids become changed, weakened, or modified by antecedent action, adulteration, or obstruction from the characteristic oil, gum, &c.

I take the cotton in its natural state and subject it to the following treatment or process: The cotton is first cleaned in any ordinary way, all dirt or other foreign matter being removed therefrom and the fiber being left as pure as it can be made. Then it is formed into a "lap." This is done, as in ordinary treatment for spinning, by passing the material through an opener, then through a beater or lapper, and thence to the carding-machine, where the card is formed preliminary to being fed to the cutting-machine, as shown in Fig. 1. The construction of the carding-machine need not be further described, since it is like ordinary carding-machines used in preparing cotton and like fibrous material for spinning; but the object in this case is different. For spinning purposes the carding disposes the fibers lengthwise of the card, since the material will then draw properly, and it is carded for that purpose. I, however, do not require or desire to avail myself of the fact that the fibers will cling together and draw more perfectly when lying side by side. My object in disposing them in this way is that I may thereby present a card or mass of fiber to the cutting knife-edges at right angles, so as to be uniformly cut off at the ends nearest the knives and across the lay of the card, since in that way the material is most thoroughly and quickly reduced to dust, whereas if the fibers extend on lines parallel to the knife-edges or line of cut they will—some of them—be removed from the card by separation without cutting, which would tend to defeat my object or at least impair the results I am seeking.

The endless apron N, passing around the feed-roller R', which may be fluted for the purpose and acts with its associate roller R, carries the card D into the grasp of these two

rollers, which cause the card to move horizontally upon the top of the knife K, the cutting-edge of which is straight, and upon which the clamp C firmly holds the card while the revolving knives K' pass by in succession and with a draw or shear cut remove that part of the card which projects beyond the straight edge of the knife K. The card is carried forward to the knives by a step-by-step movement in advance of the approach of each arm and knife K' the distance of, say, one thirty-second ( $\frac{1}{32}$ ) of an inch, that being the length of the cut I prefer for cotton, though it may be increased or diminished at will, as desired, without avoiding my invention.

The cotton-dust drops into a box or other receptacle (not shown) and is removed at intervals.

The machine may be further described as follows: The knife-wheel W is provided with, say, four arms, to the outer faces of which the knives K' are secured in any ordinary way. The rear of one set of these arms is shown in Fig. 1 in perspective. The knives K' are disposed spirally, and, beginning at one side of the knife K, cut across it, each in turn, as the knife-wheel W revolves.

P is the driving-pulley of the cutter, and through the gear-wheel on its shaft S<sup>2</sup> and the large gear-wheel G on the cutter-wheel shaft directly operates the knives K'. By means of the eccentric cam E and its connecting-rod, operating through the rocker-arms A and A', the vibrating cam C', and the clamp-head H, the clamp C is raised and lowered as required to allow the card D to advance and to compress and hold it during the cutting operation. The functions of the rocker-arms A and A' are to move the vibrating cam C' and thereby depress the clamp-head and clamp, and also, through the pawls P' and P'' and the ratchet-wheel R<sup>2</sup>, cause the feed-rollers R and R' to advance the card D as required step by step. The cams C' are supported, one at each side of the machine and outside of the frame F, upon stems S<sup>6</sup>, which move in guide-blocks G', and are surrounded by spiral springs S<sup>7</sup>, which when the rocker-arm A' is moved to the short arm of the cam C' cause the cam C', the clamp-head H, and the clamp C to rise and release the card for the subsequent advance of the same, and as the rocker-arm A is raised the arm A' and its roller, moving toward the other end of the cam C', cause the clamp C to engage the card D again. Between the clamp C and the clamp-head H, I interpose an elastic cushion E', preferably of rubber, to accommodate any irregularity in the thickness of the card. The clamp and clamp-head move in the curved guide-slots H' on lines described from the center of the knife-wheel W. To accommodate the wear of the knife K, it is pivoted at each end at P<sup>3</sup> and provided with two arms A<sup>2</sup>, which are secured and moved at will by means of the set-screws S and S', as required for that purpose. The feed-roller



R is movable slightly under control of springs at each end in order to accommodate the cards.

Instead of reducing the cotton fiber to dust  
5 by cutting or by carding and cutting in the manner and by means of the mechanism described, I contemplate the use of any machinery, known or unknown, in which by a cutting, a beating, a grinding, or a pulverizing action alone, or by a cutting, a pulverizing, a beating, and a grinding action combined in any form, the cotton fiber may be operated upon and reduced to a finely-divided or dust-like condition; and I do not intend to  
15 confine or limit myself to this or to any particular kind of machinery for reducing the cotton fiber to dust, my object being to take the cotton fiber in its natural state and reduce it as nearly as possible within reasonable  
20 limits to the condition of dust by mechanical means, so as to leave the article in the natural state otherwise than as I have described. In other words, I seek to avoid all methods of reducing the fiber to a finely-divided  
25 state by any means, chemical or other, that will leave therein any of the obstructive elements heretofore mentioned, which will interfere with, delay, hinder, or prevent the required reactions and treatment of the cotton-  
30 dust required in making use of the article or material in the various ways and for the various purposes to which it is or may be adapted. I can accomplish the same results if, in addition to carding, I spin the cotton fiber into  
35 yarns after carding it, (although that operation is unnecessary and a waste of time and expense,) and in single threads or in hanks composed of many threads expose the material to the same cutting or pulverizing action,  
40 cotton-dust being the product of such treatment.

The article of cotton-dust produced by mechanical means in the manner described is distinguishable from other articles, and especially from cotton-dust or other fiber dust obtained by chemical means, by its appearance,  
45 as dust of cotton, and as having more of the natural characteristics of cotton fiber than the dust obtained by chemical means, by  
50 means other than mechanical, or by mechanical means after chemical treatment.

This new or improved article of cotton-dust produced by mechanical means may be sold in the market as an article of manufacture, and may be used in the arts as the base of various products in which the pure cotton fiber is the natural base, being treated subsequently as required for the desired purpose, some of which products and the methods of producing the same are described in other applications  
55 filed by me January 7, 1884, Serial No. 116,641, and January 9, 1884, Serial Nos. 116,929 and 116,930.

I am aware that wood and woody fiber have been reduced to granular form by mechanical means, and that an impalpable powder has been produced from cotton fiber by chemical treatment, succeeded by pulping, drying, and sieving. I am also aware that various vegetable substances after pulping have been  
65 pressed into sheets, dried, and punched, cut, pulverized, or ground to produce a fine powder, which is subsequently treated with acids in the manufacture of nitro-cellulose. These I do not claim. 75

What I claim as my invention is—

1. The herein-described process of preparing cotton for subsequent chemical treatment as a base for the manufacture of nitro-cellulose, which consists in taking the cotton fiber  
80 in its natural state and reducing it to cotton-dust by mechanical means alone, substantially as described.

2. The herein-described process of preparing cotton for subsequent chemical treatment as a base for the manufacture of nitro-cellulose, which consists in first forming the cotton fibers into a card or lap, and subsequently cutting or otherwise reducing the fibers in their natural state to cotton-dust by mechanical means alone, substantially as described. 90

3. The herein-described article of manufacture, consisting of mechanically-comminuted cotton-fiber dust for use in the manufacture of nitro-cellulose.

JOSEPH R. FRANCE.

Witnesses:

JAMES A. SKELTON,  
WILLIAM J. STEVENS.