No. 804,586. PATENTED NOV. 14, 1905.

I. P. DILLON.

PAPER REFINING ENGINE.

APPLICATION FILED JUNE 8, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

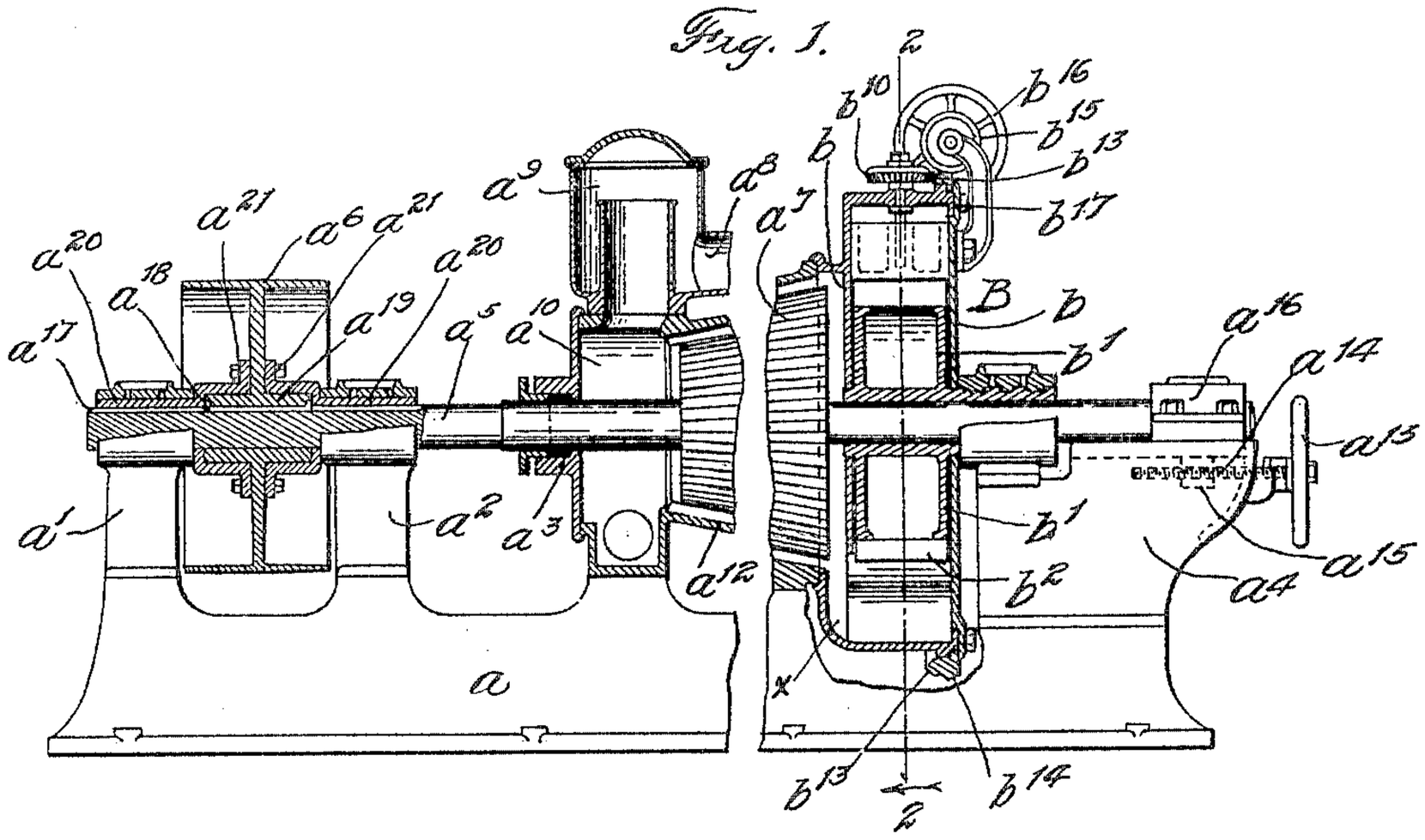


Fig. 2.

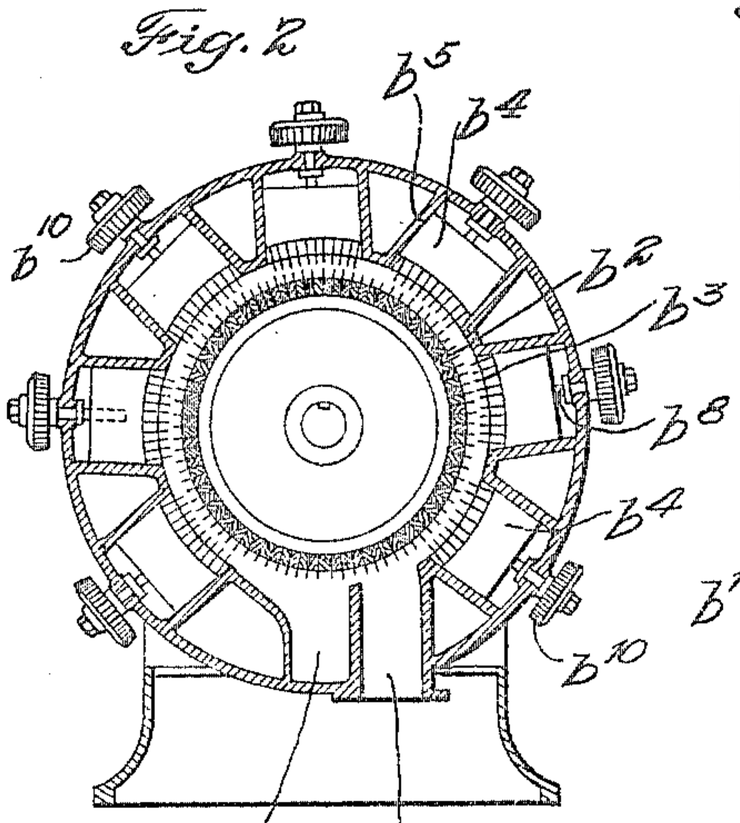


Fig. 3.

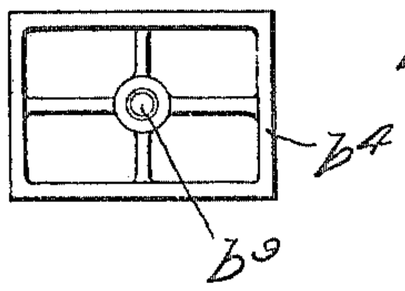


Fig. 4

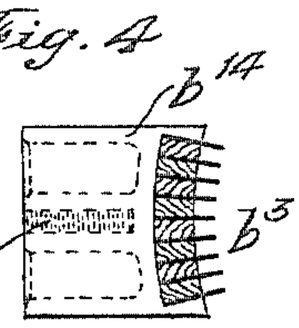
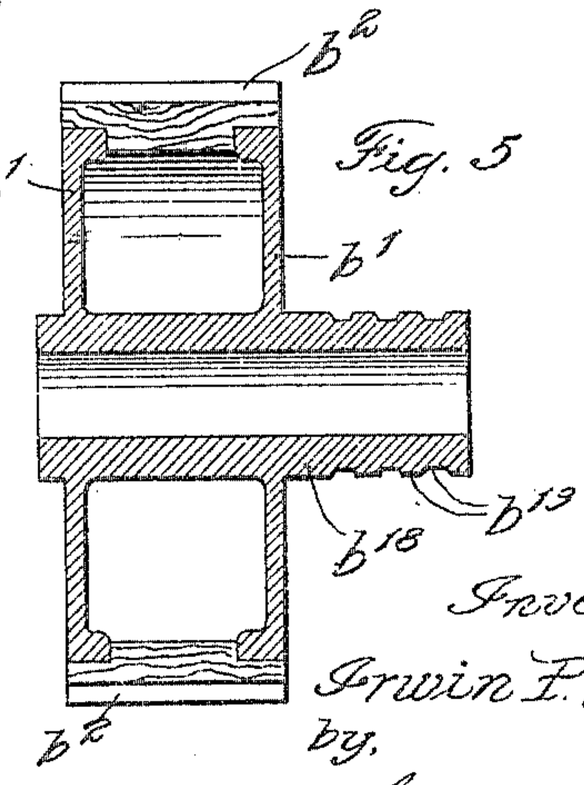


Fig. 5



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2 SHEETS—SHEET 2.

Fig. 6.

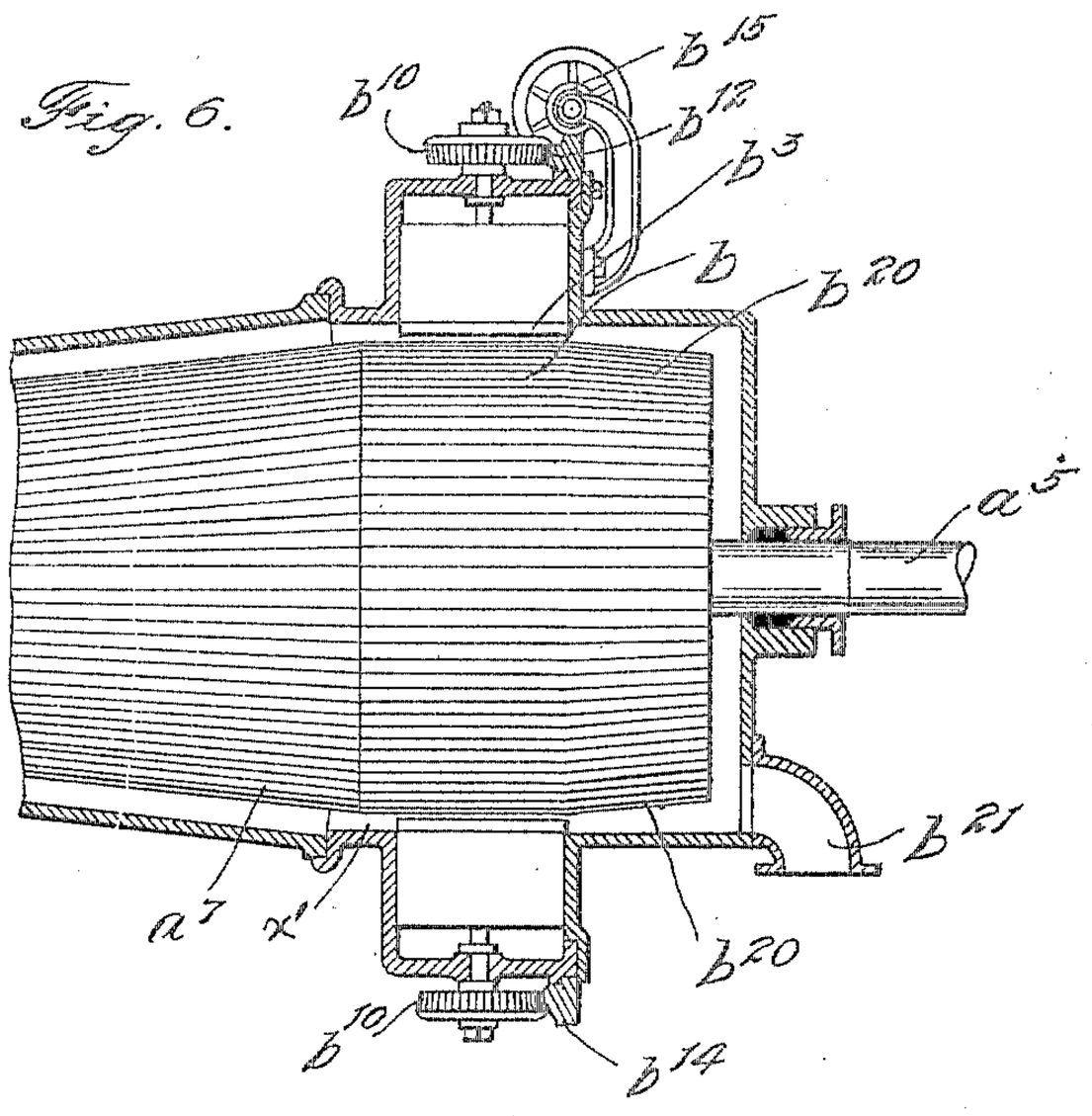


Fig. 7.

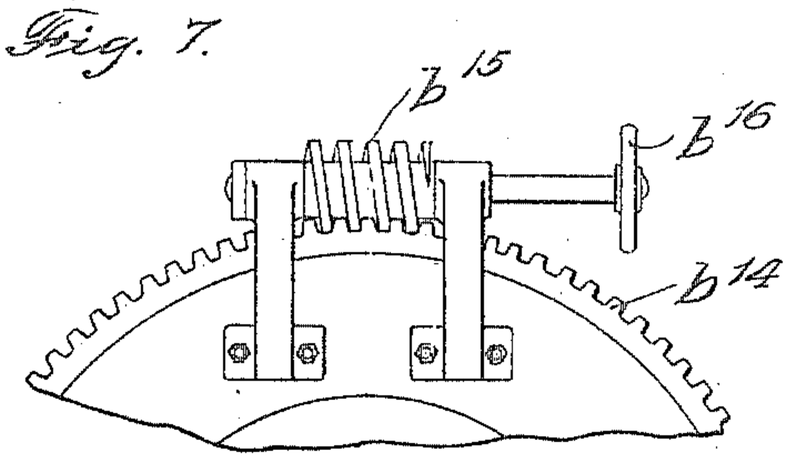


Fig. 8.

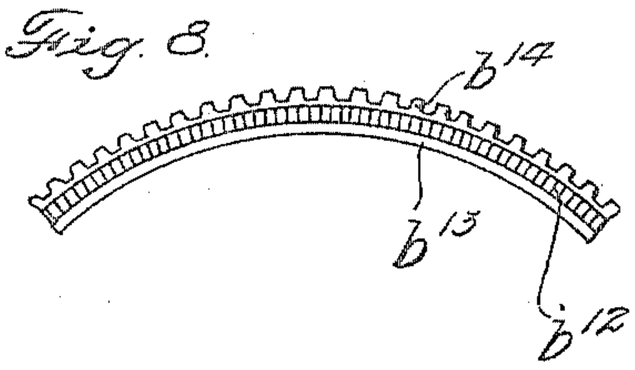
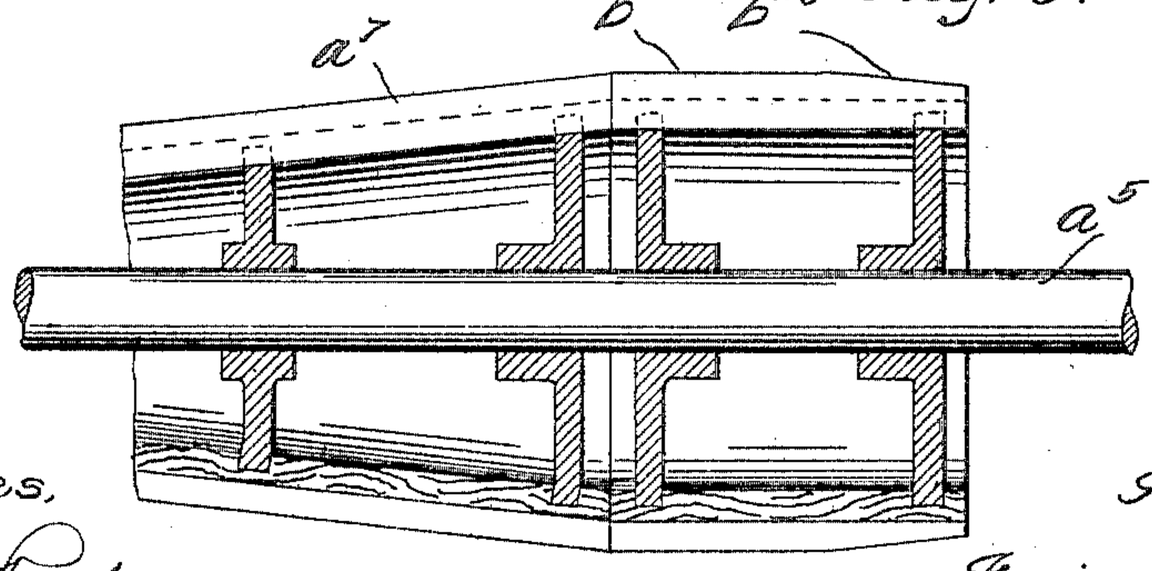


Fig. 9.



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UNITED STATES PATENT OFFICE.

IRWIN P. DILLON, OF LAWRENCE, MASSACHUSETTS.

PAPER-REFINING ENGINE.

No. 804,586. Specification of Letters Patent. Patented Nov. 14, 1905.

Application filed June 8, 1904. Serial No. 211,598.

To all whom it may concern:

Be it known that I, IRWIN P. DILLON, a citizen of the United States, and a resident of Lawrence, Massachusetts, have invented an Improvement in Paper-Refining Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is an improvement in refining-engines for use in manufacturing fine grades of paper.

Heretofore it has not been considered practicable to use a refining-engine for making the finer grades of paper; but instead thereof the pulp has been kept a greater length of time in the beater, which of course results in more expense and considerable loss of time. Accordingly I have devised the means hereinafter described for adapting the usual refining-engine to all classes of work. The reason why the ordinary refining-engine has not been adapted for the finer grades of work has been that because of the conical shape of the plug and its casing the paper stuff or pulp has its fibers twisted or rolled together as they travel spirally from the small end of the engine to the other end thereof, this twisting tending to shorten the fiber, and thereby render the resulting paper deficient in strength and quality.

Hence my invention, broadly stated, consists in providing means for untwisting or straightening out and lengthening or drawing out the fiber, so that it is restored to its proper condition as required for producing the strongest paper.

While my invention is capable of many different embodiments, I prefer to provide means at the outlet end of the engine for receiving the pulp and gradually straightening and drawing out the fibers thereof, the means which I employ preferably consisting of a cylindrical refining-wheel or other moving surface having all parts thereof moving at the same speed with relation to a coöperating surface, the result being that the fiber is simply drawn out or straightened, there not being any possibility of its path of movement being diverted from a straight line.

The constructional details of my invention will be pointed out more at length in the following description, reference being had to the accompanying drawings, in which I have shown a complete embodiment of my invention.

In the drawings, Figure 1 is a view, largely in vertical longitudinal section and partly in side elevation, of a refining-engine embodying my invention. Fig. 2 is a transverse sectional view thereof, taken on the line 2 2, Fig. 1. Fig. 3 is a plan view of one of the grinding blocks or frames, said figure being taken looking toward Fig. 4 from the left. Fig. 4 is a view in end elevation looking at Fig. 3 from the right. Fig. 5 is an enlarged central vertical sectional view of a portion of the drum or fiber-straightening wheel. Fig. 6 is a vertical longitudinal sectional view of a modified form of straightening device. Fig. 7 is an enlarged detail, in side elevation, of the hand-operating mechanism for adjusting the fiber-straightening means. Fig. 8 is a fragmentary detail, in side elevation, of one of the gears. Fig. 9 is a sectional view of a portion of the construction shown in Fig. 6.

Mounted on a suitable base a are uprights a' a^2 a^3 a^4, in which is journaled a shaft a^5, driven by a pulley a^6 and carrying a usual refining-plug a^7, coöperating with a usual feed-inlet a^8, trap a^9, neck a^{10}, and plug-casing a^{12}, said shaft a^5 being adjustable longitudinally in usual manner by a hand-wheel a^{13} and screw a^{14}, operating in a nut a^{15} on the under side of a journal-box a^{16}, sliding with the shaft on a way in the upright a^4, all as set forth, for instance, in my Patent No. 621,298, of March 14, 1899. As the paper-pulp passes in at the inlet a^8 and after being properly settled, &c., reaches the refining-engine proper or plug portion of the engine it is forced forward between the revolving surface of the conical plug a^7 and the lining of the casing a^{12}, the result being that it travels in a spiral path, being rolled over and over as it moves forward, and because of the conical shape of the refining members it reaches the outlet end of the plug in a twisted condition. Accordingly I provide at the outlet end of the plug a straightening device B for drawing out and untwisting the fibers which have been thus twisted, as explained.

The device B, as shown in Sheet I of the drawings, consists of a chamber b, containing a wheel or cylinder b', provided peripherally with refining blades or bars b^2, (shown most clearly in Fig. 2,) coöperationg with stationary blades or bars b^3, peripherally arranged in a plurality of groups concentrically about the wheel or cylinder b' and adjustably carried in blocks or frames b^4, sliding in radial pockets b^5, formed in the walls of the chamber b.

As the cylinder rotates the coöperating sur-

faces b^2 b^3 gradually straighten out the twisted fiber and smooth it or draw it out into its properly-lengthened position, so that the fibers overlap and bind strongly upon each other, thereby avoiding or preventing delivering the pulp from the engine in a twisted condition. This result is accomplished by interposing the straightener as described, because of which the stock or pulp is obliged to travel in a single plane before it is finally delivered, the pulp traveling in this single plane a sufficient length of time to insure that its fibers are all drawn out straight and into their properly-lengthened and parallel condition. In other words, the stock is put back as nearly as possible into the form, so far as the relation of its fibers is concerned, in which it was when it left the beater. The stock enters the straightener B from the plug a^7 at b^6 and after traveling entirely around the same it leaves at the discharge-outlet b^7.

The various frames or blocks b^4 are each adjustable, as already stated, being carried by screws b^8, entering threaded openings b^9 (see Figs. 3 and 4) in the respective blocks, said screws carrying at their outer ends beveled gears b^{10}, engaged by the teeth b^{12} of a ring-gear b^{13}, provided on its outer surface with worm-teeth b^{14}, driven by a worm b^{15}, operated by a hand-wheel b^{16}, (see Figs. 7 and 8,) said gear b^{13} being mounted in a circular groove b^{17} in the chamber-casing b, as clearly shown in Figs. 1 and 6.

As shown in Fig. 1, the fiber-straightening device B is rigidly held in position as a part of the main frame, and the drum b' thereof has a hub b^{18} projecting laterally therefrom and held interlocked by grooves and ribs b^{19} with its journal-bearing. In some instances, however, it is convenient to have the straightener move with the plug a^7 and shaft a^5, and under such circumstances I fix the cylinder thereof directly on the shaft a^5 and mount it directly against the end of the plug a^7, as shown clearly in Figs. 6 and 9, the construction otherwise being the same, excepting that the cylinder b' has an extension b^{20}, whose ribs or straightening-surface is slightly beveled, as indicated (where it is somewhat exaggerating for clearness of illustration.) The reason for providing this outer extension and beveling the same is to provide for the adjustment thereof to the left, Fig. 6, as the surfaces of the block a^7 and adjacent parts wear away and also to provide that as the part b^{20} is brought beneath the surface b^3 its diameter will correspond to the decreased or worn diameter of the part b' at the time of said adjustment. In this construction the straightened fiber is delivered for convenience at b^{21}. In both constructions I provide a gap or pocket between the cylindrical part and the conical part, as indicated at x, Fig. 1, and x', Fig. 6, this pocket being sufficient in extent to permit the stock to lose its alinement or direct path of travel before entering upon the straightening action.

Having provided the straightener B, as above explained, thereby having increased the normal length of the machine, it becomes desirable to shorten the mechanism so that the entire machine will not occupy any greater length than usual, and accordingly instead of having the pulley a^6 fast directly on the shaft a^5, as has been the practice heretofore, in which case the shaft and pulley have both been adjusted lengthwise together, I provide means for maintaining the pulley a^6 non-adjustable lengthwise, and hence by this means I am enabled to decrease the distance between the uprights a' and a^2. I accomplish this result by providing in the shaft a^5 a long keyway a^{17}, in which rests a key a^{18} for locking the hub a^{19} of the pulley a^6 therewith, while permitting the shaft to move longitudinally with reference to said pulley, and to prevent the key-seat a^{17} from cutting the journal-bearings I provide opposite sleeves a^{20}, surrounding the shaft a^5 and secured to the pulley at a^{21}, said sleeves rotating in the bearings of the uprights a' and a^2. It will thus be seen that notwithstanding the additional length of grinding-surface provided by my invention the machine itself is the same length as before.

It will be understood that my invention may be carried out in various embodiments, the gist of the invention residing in providing means for brushing out and straightening the fibers of the pulp or paper-stock as the latter leaves the engine, and accordingly I wish it understood that many changes in form, arrangement, and relation of parts may be resorted to without departing from the spirit and scope of my invention as further defined in the claims.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a refining-engine, a fiber-straightener, having located at the outgoing end of the conical plug, and separated therefrom by a peripheral gap or pocket, and mechanism, including engaging surfaces relatively movable, for compelling the independent fibers of the paper-stock to travel in single parallel planes, whereby the fibers are brushed out straight and parallel before delivery from the engine.

2. A refining-engine, comprising a conical plug and a coöperating grinding-surface, and adjacent to the outlet end thereof similar surfaces cylindrical in shape, and relatively adjustable radially for receiving the pulp from the conical surfaces.

3. A refining-engine comprising a conical plug and a coöperating outer conical grinding-surface, and having adjacent its outlet end a fiber-straightener comprising a cylindrical portion provided peripherally with fiber-engaging bars, and an outer coöperat-

ing fiber-engaging surface separated from said conical grinding-surface by a gap or pocket for receiving the pulp before it passes between the cylindrical grinding-surfaces.

4. A refining-engine, comprising a conical plug and a coöperating conical grinding-surface, combined with a chamber separated from said plug at the outgoing end thereof by an intervening pocket, said chamber containing a cylindrical, rotary grinding-surface and a coöperating grinding-surface adjustable radially thereof.

5. In a refining-engine, comprising a conical plug, and a coöperating casing, a fiber-straightener adjacent thereto, a shaft carrying said parts and longitudinally adjustable, a driving-pulley mounted on said shaft to rotate the latter, a key-seat in said shaft, a key from said pulley engaging said key-seat and longitudinally movable therein, and connecting means secured to said pulley and surrounding said shaft to rotate therewith while holding said pulley against longitudinal movement.

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

IRWIN P. DILLON.

Witnesses:
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JOHN E. PORTER.