C. W. ROBERTS.

PULP.

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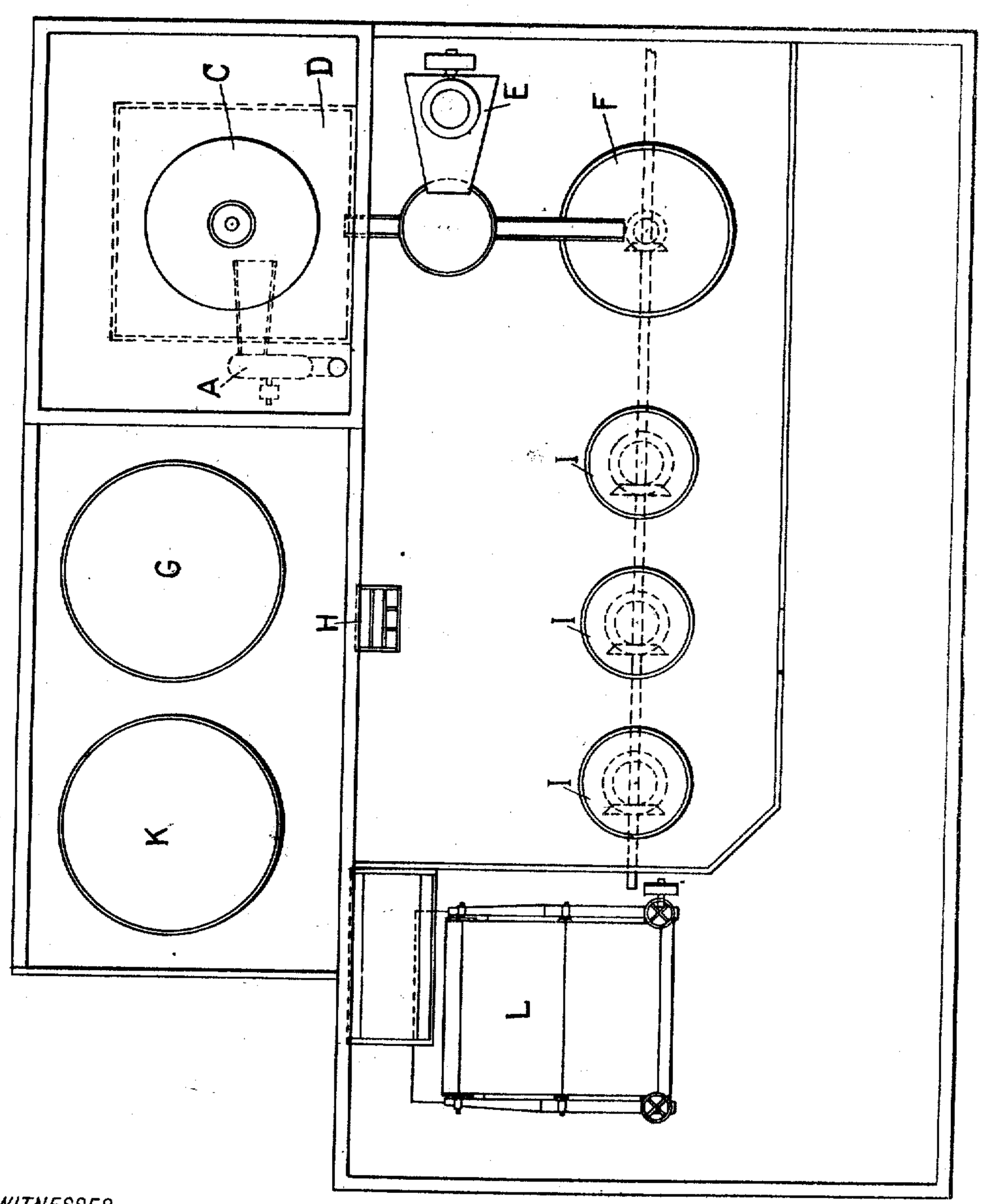

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PULP.

954,209. Specification of Letters Patent. **Patented Apr. 5, 1910.**

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To all whom it may concern:

Be it known that I, CHARLES W. ROBERTS, a citizen of the United States, residing at Lockport, New York, have invented a certain new and useful Process for Manufacturing Pulp, of which the following is a specification.

Heretofore in the manufacture of paperboard from spruce and similar woods, the logs were first stripped of bark and these shavings or "rossings" were used for fuel or in some other way whereby the rossings were disposed of, they being considered in the nature of waste material. As it was important that the spruce logs subsequently to be treated for the purpose of making pulp out of them, were required to be completely clear of all bark, it followed that these rossings consisted of a very considerable proportion of wood in addition to the outer surface of the bark, the proportion in many cases being 70% wood fiber and 30% more or less powdery bark. I for years tried to make use of these shavings for the purpose of making pulp therefrom but their nature and consistency defied all my efforts, they being hard and thin and there being no known way of separating or disintegrating their fibers so as to make them useful for the purposes of wood pulp. I have now, after many experiments and much thought, discovered a way of using these rossings for the purpose of making an excellent wood pulp in all respects, so far as I can see, equal to the pulp made from the spruce logs according to the old process and in some respects, superior thereto. The process of treating these rossings, which I have devised, is applicable to other fiber, however, and I do not in my broader claims desire to restrict myself to the use of the process in connection with the rossings.

The object of my invention is, therefore, to produce a wood pulp for use in the manufacture of paper or paperboard with greater economy than heretofore, and the invention consists more particularly in the process of manufacture of such pulp as hereinafter described and claimed.

In the accompanying drawings I have shown a plan of a mill in which the process devised by me may be efficiently carried out.

Before explaining this drawing in detail, I shall describe the nature of my invention. I first take the thin and hard shavings, consisting as above stated of, for instance, 70% fiber and 30% bark, together with the refuse sawdust that comes from the wood pulp mill, and run them through a cutter. This cutter reduces the entire mass of material into short lengths. Except for the dust, I prefer to arrange the cutter so that the bulk of the rossings is reduced to lengths not less than $\frac{1}{4}$ inch long and not more than three inches long. When the rossings are in this condition, they are placed into a boiler and cooked, preferably under a pressure of not less than 20 pounds and not more than 120 pounds. This cooking is continued until the shavings are thoroughly softened, after which the cooker is dumped into a storage vat beneath the same. From this storage vat the material is passed through, what I call for want of a better term, a compressor. The construction of the compressor is immaterial. The use of this compressor at this particular point in the operation is of the essence of my invention. The work it must accomplish is the following: The softened shavings from the cooker must be compressed under a high pressure and simultaneously with such compression must be allowed a motion of all their constituents with reference to each other. In other words, there must be a compound motion whereby, as the compression proceeds, the various individual shavings will rub against the adjacent shavings so that, as the operation proceeds, the fibers comprising the individual shavings will thoroughly and completely rub themselves apart. In this way not only is moisture driven out from the body of the shavings (in the machine as I adjust it to the extent of about 80% of the water) but the fibers as they emerge from the machine are almost completely individualized. An ordinary grinding machine is unable to do this work because of the exceedingly high pressure which is the prerequisite of this step in the process. I prefer to use for this purpose a machine having a strong outer casing tapering toward one end, which contains a solid tapering core spirally grooved, the spiral groove diminishing in diameter as the orifice of the machine is reached. The shavings are introduced where the spiral and the machine have the largest diameter and, by reason of the diminishing diameter of the spiral and of the tremendous pressure which such a machine

affords, I obtain the exact result aimed at. The stock as it emerges from this compressor passes through a small die having a discharge opening for the completely treated stock. The action of this compressor, acting as it does under an enormous pressure on the stock, brings the stock into a condition where the fibers readily separate and from this point on they are easily made flexible and readily take on the felting quality so much desired in the manufacture of paperboard or the like.

The particular compressor which I preferably use is a well known machine and is used for other purposes in the paper making arts so that its detailed construction need not be described. After the stock has been compressed and is in a condition for the ready separation of its fibers, it is passed through the usual paper making process; that is, it passes through a grinder which reduces the stock to almost its final condition. Large quantities of the compressed softened stock can be added to the grinding machine because, being dry, it occupies very much less physical space than is the case in the process now in use. Fresh water is added to the grinding machine in quantities sufficient to proceed with the further process.

From the grinder the stock is passed to a large storage vat continuously agitated so as not to allow the fiber to settle. From this storage vat the stock is withdrawn as desired through a distributing vat into a refining engine, after which it is in condition to go on to the wet machine. By using the compressor at the point where I use it, I not only make it possible to use the rossings which have heretofore always been useless but I also enable the grinders and refiners (in case of other stock as well as of shavings) to do far more work at far greater speed. Where now, for instance, the capacity of a pulp mill is limited by the number of refining engines, the introduction of a compressor at the point of the operation selected by me makes it possible for the refiners and the grinder to do at least three times the amount of work done by these machines under ordinary circumstances. In the mill illustrated in the drawings, for instance, if it were desired to treble the capacity, it would be necessary to introduce at least six new refining engines. By the introduction of the compressor between the cooker and the grinder, however, the present size and arrangement of the mill is sufficient to do this vastly augmented work without the addition of any new engines or the employment of more workmen.

In the drawing "A" designates the cutter; "C" the cooker; "D" the storage vat for the cooked shavings; "E" the compressor; "F" the grinder; "G" the storage vat for the ground shavings; "H" the distributing vat; "I" the refiners; "K" the final storage vat and "L" the wet machine.

From the above description it will be noticed that my invention differs from the process of making pulp chiefly in the introduction at that stage of the process after the stock has been cooked of a step whereby the material is thoroughly softened, dried and compressed and to a certain extent disintegrated into its component fibers. In the case of rossings, the bark gives the fiber a rich brown tint. The fiber, that is, the wood pulp, produced from these rossings is exceedingly strong and tough and is in all respects as efficient and useful as the fiber which has heretofore been produced from the spruce logs.

It will be seen that by my invention I am enabled to make use of a paper mill product which has gone to waste to the extent of thousands of tons in the past and that the invention will enable me to erect and maintain many pulp mills and to give employment to a large force of workmen where formerly there was absolutely no industry whatsoever.

Having now particularly described the nature of this invention, I claim:

1. The improvement in the process of making wood pulp which comprises subjecting the cut and cooked stock to attrition under great compression then grinding the stock for the first time, substantially as described.

2. The process of making paper pulp which comprises cooking the stock, subjecting it to enormous pressure and attrition obtained by compressing it in all directions simultaneously, then grinding and refining the compressed product substantially as described.

3. The process of making wood pulp which comprises cooking the disintegrated wood then simultaneously compressing and drying it while subjecting it to attrition by the application of enormous pressure in all directions simultaneously and reducing the compressed stock into fibers substantially as described.

4. The process of making wood pulp which comprises cooking the stock then subjecting it to enormous pressure in all directions simultaneously while causing the individual particles to rub against and disintegrate one another and subsequently grinding the compressed mass, substantially as described.

5. The process of making wood pulp from shavings or rossings which comprises cutting the same into lengths of substantially uniform size, cooking the same, then compressing the individual particles under the influence of attrition into a homogeneous mass of loosened, softened wood cells, and

finally grinding the softened stock, substantially as described.

6. The process of making paper pulp which comprises cooking the stock, subjecting it to enormous pressure by pressing it in all directions simultaneously so as to expel the water and at the same time induce sufficient attrition to loosen the individual fibers, then adding water to the resulting product while grinding it and disintegrating such product in the presence of a large amount of water, substantially as described.

7. The process of making paper pulp which comprises subjecting the stock to enormous pressure and attrition obtained by compressing it in all directions simultaneously, then grinding and refining the compressed product substantially as described.

8. The process of making wood pulp which comprises simultaneously compressing and drying the disintegrated wood, while subjecting it to attrition by the application of enormous pressure in all directions simultaneously and reducing the compressed stock into fibers substantially as described.

9. The process of making wood pulp which comprises subjecting the stock to enormous pressure in all directions simultaneously while causing the individual particles to rub against and disintegrate one another and subsequently grinding the compressed mass, substantially as described.

10. The process of making paper pulp which comprises subjecting the stock to enormous pressure by pressing it in all directions simultaneously so as to expel the water and at the same time induce sufficient attrition to loosen the individual fibers, then adding water to the resulting product while grinding it and disintegrating such product in the presence of a large amount of water, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES W. ROBERTS.

Witnesses:
W. JOHN HINCKEY,
J. L. SHELDON, Jr.