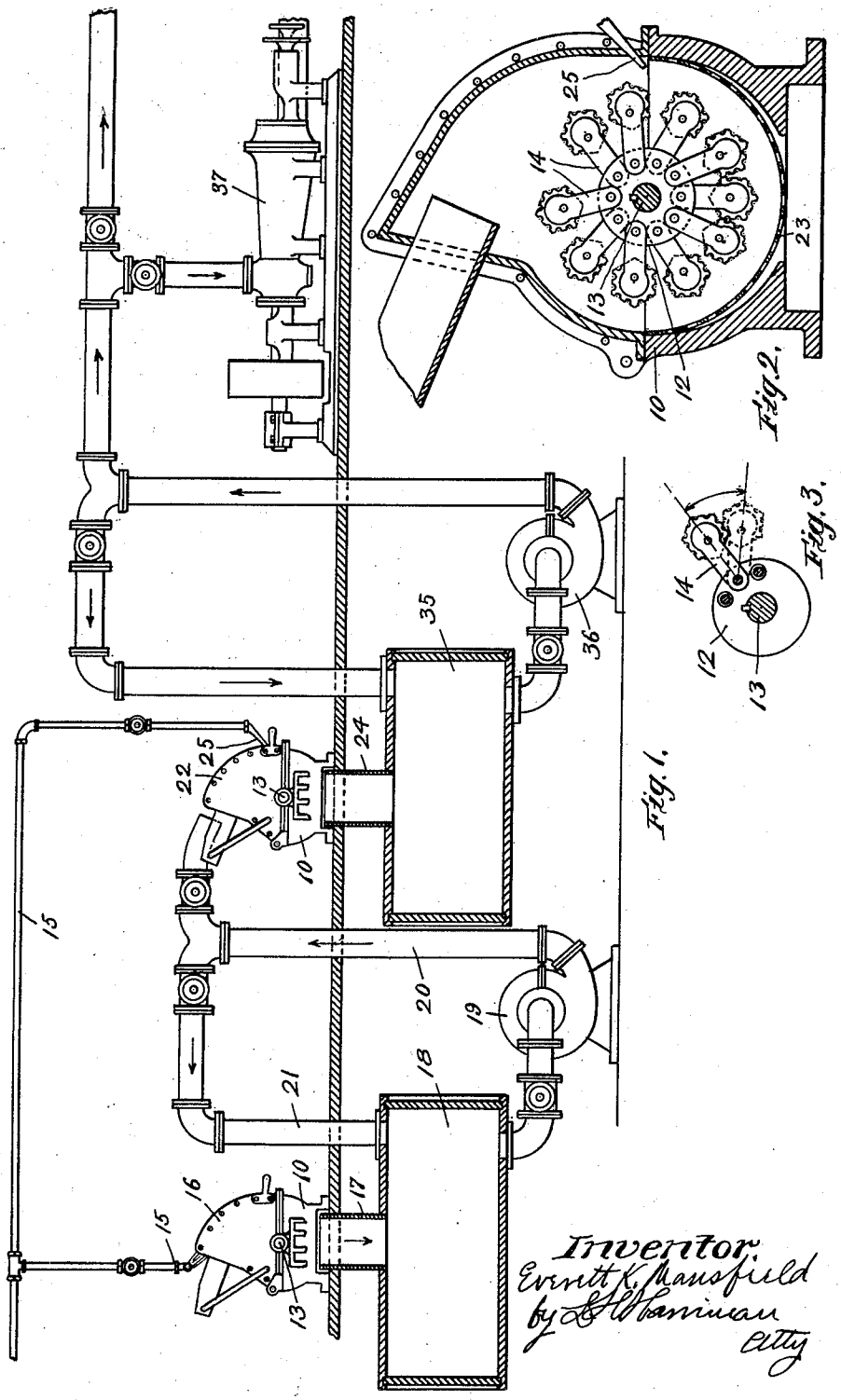
April 21, 1936. E. K. MANSFIELD 2,038,374

PAPER STOCK PREPARATION

Filed June 14, 1933 2 Sheets-Sheet 1



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PAPER STOCK PREPARATION

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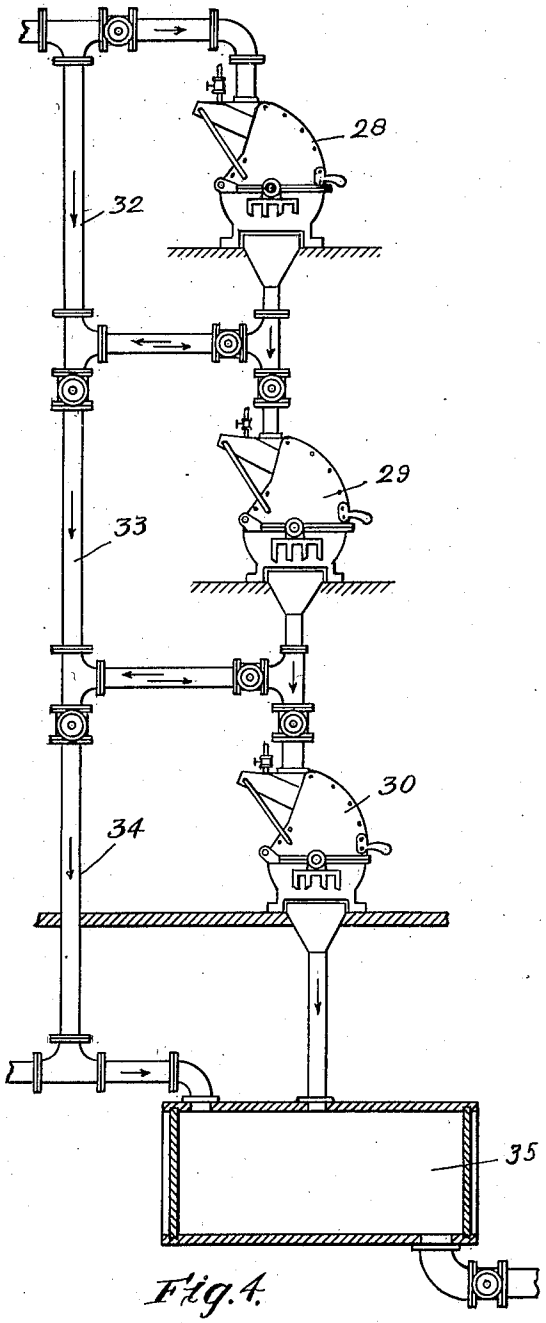


Fig. 4.

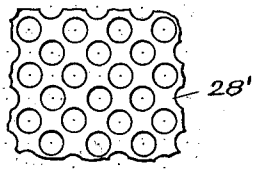


Fig. 5.

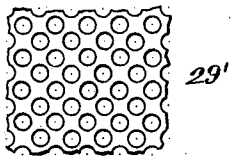


Fig. 6.

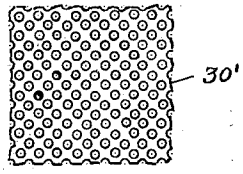


Fig. 7.

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UNITED STATES PATENT OFFICE

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PAPER STOCK PREPARATION

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Application June 14, 1933, Serial No. 675,762

2 Claims. (Cl. 92—20)

This invention relates to methods of defibering and hydrating paper stock, immediately preceding delivery to the paper making machine. This operation, as ordinarily performed, has required the simultaneous operation of a number, usually six or more, refining engines, either of the beater type having a horizontal roll, or the "Jordan" type, to supply a single paper making machine, these machines usually being operated from 2 to 6 hours or more for each charge, according to conditions, and the power required for their operation being very large in amount.

In a machine of this type, in which a roll, having blades rigidly mounted therein, is operated in practically fixed relation to a bed in which similar blades are mounted, the fibers of the stock which is passed between them are frequently cut or shortened to an undesirable extent. Also, with the system above referred to, if it is found that the product is not satisfactory, by reason of imperfect defiberization, or hydration, or both, so that a change in this operation is necessary to correct the defect, the change when made will not usually affect the product for approximately 6 or 8 hours, so that a large loss may be suffered before it can be determined whether any change which was made is effective.

The objects of my invention are to provide an improved method, or system of defibering and hydrating paper stock, which will enable the operation to be much more rapidly performed than is possible with the method above referred to, and which will result in a large saving of horse power and will enable practically perfect uniformity of defiberization and hydration to be secured without cutting or shortening the fibers to a substantial extent. Also which will enable a practically continuous system of defiberization and hydration to be employed so that the employment of large stuff chests will be unnecessary, and defects in the product of the paper making machine may be corrected in a comparatively short time, as compared with what has been possible with previously employed systems.

I accomplish these objects by operating on the partly disintegrated stock while thoroughly saturated with water, by striking the same, while unsupported, or yieldably supported in water, within an enclosed casing, by means of rapidly moving, loosely mounted swinging arms, or heads, so that defiberization and hydration will be caused by the impact of the latter on the stock in the presence of water, and the action on the stock will be a matter of relative inertias of the striking devices and the stock, as distinguished from the positive action which takes place when the stock is forced by a positively driven, unyieldable operating device into engagement with a fixed operating device.

Also by providing a connected series of devices, of the impact type above referred to, having graduated screens through which the stock is discharged from each casing, so arranged that the stock may be operated on to an increased or a diminished extent as it is supplied to the paper making machine, and the extent of defiberization and hydration may be readily varied and the results of the variation may be noted in the product shortly after the variation is made.

For a more complete disclosure of the invention reference is made to the following specification in connection with the accompanying drawings in which:—

Fig. 1 is an elevation, in diagram form, of a defibering and hydrating system embodying my invention.

Fig. 2 is a sectional view of a type of apparatus which is employed in connection therewith.

Fig. 3 is a detail view of a portion of said apparatus.

Fig. 4 is a view, similar to Fig. 1, of a modified form of the invention and

Figs. 5, 6, and 7 are detail views indicating parts of the apparatus shown in Fig. 4.

As a preliminary to the process hereinafter described, the stock must be broken up and saturated with water. This may be accomplished by means of an ordinary horizontal beater, in which the roll is raised at a considerable distance above the bed and from which the stock will be discharged when it is sufficiently broken up and saturated, to form what is known as slush stock.

Another and preferable means of breaking up the stock consists in the employment, in lieu of the beater, of a type of machine known as a hammer mill, a form of which is illustrated in Figs. 2 and 3, and which comprises a casing 10 having a rotor 12 mounted on a horizontal shaft 13 therein, said rotor having a series of arms 14 pivotally mounted thereon in radial relation, each arm being arranged to swing in the direction of rotation to a limited extent from a radial position, and having a head, of any suitable form, on its free end. As machines of this type are well known, further description thereof is thought to be unnecessary. In practice they have usually been employed in disintegrating material when dry.

In the arrangement shown in Fig. 1, a suitable source of water supply 15 is provided at the entrance opening of a hammer mill 16, of the type

above referred to, so that the stock will be partly saturated and broken up by the rotor, and then discharged through a coarse screen in the bottom of the casing, into an outlet pipe **17**, and chest **18**, from which it is drawn by a rotary pump **19**. The discharge pipe **20** of the pump may be connected back to the chest by a pipe **21**, so that the stock may be further disintegrated and hydrated by circulating it through the chest, or it may then be immediately discharged into a second hammer mill **22**, in which the principal operation takes place. The mill **22** is provided with a screen, as **23**, in its bottom through which all material must pass before being delivered to its discharge pipe **24**, and a series of nozzles, as **25**, are preferably connected to the water supply and arranged to direct water jets onto the screen, to assist in the passage of the defibered stock therethrough and to enable a suitable supply of water to be maintained within the casing.

In practice, the water level will be maintained at about the middle of the casing, so that the stock will be suspended in the water while the rapidly swinging arms of rotor will strike the material a rapid succession of blows while it is freely suspended, or yieldably sustained within the casing. As the arms are yieldable against centrifugal action when they strike the stock, they will yield to some extent, and, as the stock is yieldably sustained when an arm strikes it, the disintegrating and hydrating action will be wholly by impact, the force of which will depend on the relative inertias of the arms and the material which they strike.

As a result the stock will be rapidly defibered and hydrated by the impact and there will be practically no tendency to cut the fibers. When the stock has been sufficiently operated on, it will pass through the screen, which will be kept clear by the churning action of the rotor and by the water jets directed on the inner side of the screen. The size of the reticulations in the screen will primarily determine the extent of defiberization and hydration.

The operation of securing complete defiberization and hydration of the paper stock, by means of the mechanical action thereon, in the presence of water, of the rapidly swinging arms of the mill, is performed much more rapidly and with a much smaller expenditure of power, than the time and power required by the refining engines which have previously been employed.

As indicated in Fig. 4 a series hammer mills **28**, **29** and **30** may be employed in lieu of the single mill **22**, the mill **28** having a relatively coarse screen **28'** in its outlet, the mill **29** a finer screen **29'**, and the mill **30** a still finer screen **30'**. Suitable by-passing pipes **32**, **33**, **34** are provided, so that the stock may be passed through any one of the mills only, any two or all three thereof, by merely manipulation valves in an obvious manner. The defibering operation may thus be greatly facilitated, as compared with results secured by the use of a single mill.

After the stock has passed through the screen of the mill **22**, or the screens of the series of mills **28**, **29**, **30**, it may be discharged into a chest **35**, and further hydrated by a circulating pump **36**, and may then be delivered to a Jordan engine **37** and finally to a stuff chest at the paper machine, not shown, the use of this apparatus being varied according to conditions.

By this arrangement, the supply of refined stock to the paper making machine may be made continuous, or practically so, so that the stock will have but little opportunity to settle after being discharged into the stuff chest, and if variation of the product of the paper making machine is desired, which is dependent on the extent of defiberization and hydration, such variations may be readily made and will soon be effective.

I claim:

1. The process of defibering and hydrating fibrous material, which consists in partly disintegrating the material and saturating it with water, delivering the saturated material to an enclosing chamber and subjecting it while held in aqueous suspension therein to a rapid succession of blows by centrifugally actuated means, to effect defiberization and hydration of the material by the impact resulting from the relative inertias of said means and the material while permitting the fibrous material which has been sufficiently treated to be discharged from the chamber and adding further saturated fibrous material while maintaining the same in aqueous suspension for treatment by the centrifugally actuated means.

2. An apparatus for supplying defibered, hydrated material to a paper making machine, which comprises a casing, means to supply partly disintegrated material thereto, water supply means for said casing adequate to maintain the material therein in aqueous suspension, a series of yieldably mounted operating devices in said casing arranged to be centrifugally actuated therein at high speeds, to subject the material while held in aqueous suspension within the casing to a rapid succession of blows, to affect defiberization and hydration thereof by impact resulting from the relative inertias of the operating devices and material, said casing having a reticulated discharge outlet adapted to permit the material when sufficiently operated on to pass therefrom.

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