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MANUFACTURE OF PAPER

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This invention relates to a method of sizing paper and more particularly to a method of sizing paper filled with alkaline filler.

The principal object of this invention is to provide a method of sizing paper filled with alkaline filler wherein sizing previously incorporated with fibrous material is added to the paper mix at the wet end of the paper machine.

A further object is to provide a method of sizing paper filled with alkaline filler wherein sizing is precipitated on fibrous material and such sized fibrous material is incorporated into a mix containing alkaline filler at the wet end of the paper machine.

A further object is to provide a method for sizing paper filled with alkaline filler wherein the sizing is precipitated on fibre in the absence of any substantial quantity of alkaline filler.

Other objects and advantages of this invention will become apparent during the course of the following description.

In my copending application Serial No. 304,175, filed September 5, 1928, I disclose a method by which sized paper filled with an alkaline filler may be made by introducing into a mix containing fibrous material and an alkaline filler, previously precipitated sizing such as rosin size precipitated by alum, accompanied if desired by an excess of the size precipitant such as alum, under conditions favoring the minimizing of the time and/or intimacy of contact of the precipitated sizing with the constituents of the mix, preferably at the wet end of the paper machine.

One adaptation of my method therein disclosed is that of precipitating size with a size precipitant in the presence of fibrous material and adding this sized fibrous material to a mixture of fibre and an alkaline filler under conditions favoring the minimizing of the time and/or intimacy of contact of the sized fibre with the constituents of the mix, preferably at the wet end of the paper machine. This adaptation of my process, while disclosed in my copending application, is not claimed therein. In the present application I claim this hitherto unclaimed adaptation; I also make further disclosure as to the practice of my invention and make claim to such novel features as are contained therein.

As I have disclosed in various of my copending applications, I have found that in the manufacture of paper filled with an alkaline filler, certain effects in fibrous mixes in which an alkaline filler is present, such as the effect of acidity, the effect produced by sizing such as rosin size precipitated by alum, the effect produced by a precipitate of material such as sodium silicate precipitated by alum, or the like, are greatly deteriorated if not completely destroyed by the action of the alkaline filler under the conditions ordinarily obtaining in paper manufacture, that is, conditions under which the various ingredients of the fibrous mix are in contact for a relatively long period of time and at a relatively high concentration. I have discovered, however, that if the conditions be so adjusted that the time of contact of the alkaline filler with the other constituents of the mix be greatly reduced and particularly if the intimacy of contact of the alkaline filler with the other constituents of the mix be greatly reduced, this deteriorating or destructive effect is substantially if not completely prevented. I have also devised a practical method for making use of this discovery whereby the various desired effects mentioned above and their like may be obtained in the manufacture of paper filled with an alkaline filler by the procedure of adding various ingredients to the paper mix under conditions favoring the minimizing of the time and/or intimacy of contact of these constituents with the paper mix.

Addition of these materials to the mix may in certain cases take place when the mix is in the concentrated stage providing the time which the mix remains in the concentrated stage is very brief. For example, if I introduce my material subsequent to the passage of the mix from the machine chest, i. e. the final chest prior to the paper machine, and prior to the point of dilution at the mixing box, whether or not a refining engine such

for example as a jordan be interposed between the machine chest and the paper machine, the material added will then be in contact for only a brief period of time with the ingredients of the mix, and as I have stated this procedure is in certain cases fairly satisfactory. However, inasmuch as intimacy of contact also plays a very important rôle in the deterioration or the destruction of the effects I wish to obtain, I prefer to add the materials to the fibrous mix at or subsequent to the point of dilution of the mix, that is, at or subsequent to the point where the mix is largely diluted preparatory to delivery to the web-forming device, or in other words at the wet end of the paper machine.

The material, the addition of which in the manufacture of paper filled with alkaline filler under the conditions just set forth, forms the subject matter of the present invention, is as stated above, sizing associated with fibrous material, the sizing being present usually in the form of size precipitated in the presence of fibrous material by a size precipitant, an excess of size precipitant normally being used.

A convenient method of carrying out my invention involves the employment of two independent systems of mixing and/or treating apparatus. The first system may consist advantageously of the usual mixing and/or treating machinery incident to paper manufacture such as a beater, various chests, and a refining engine such as a jordan, which finally deliver the fibrous mix to the mixing box of the paper machine. Into the beater of this system may be fed in the usual manner part of the total fibrous material which is to be used in making the paper and which may include machine broke both wet and dry, and any other fibrous material containing alkaline filler if desired, and then the alkaline filler itself (that is, the filler previously unassociated with fibre). Alum may or may not be used at this point as desired. This mix is given sufficient treatment in the beater, then dumped into a chest. It may then be conducted through a jordan to another chest and then into the mixing box of the paper machine, or the jordaning may be done subsequent to the final chest and the jordan deliver directly into the mixing box. The mix up to this point may be in a substantially unsized condition. If apparatus be used in connection with the paper machine for the recovery of the solids in the excess white water, such as sedimentation or filtration apparatus, the settlings from such a sedimentation apparatus may be conveniently returned to any prior point in the process such as the beater or the chests, or if a filtration apparatus be employed using "sweetener" stock, that is, fibrous mix for use as a filter mat, such sweetener stock may be drawn from one of the chests and after use for filtering the excess white water be suitably returned to one of the chests. Wet wastes from the paper machine other than those mentioned, for example the contents of the couch pit, may be delivered as customary into one of the chests.

The second system may conveniently consist of a beater, a chest, and a jordan engine, which finally delivers a sized fibrous mix to the mixing box of the paper machine. Into the beater of this system is fed the remainder of the total fibrous material (not fed into the beater of the first system) which is to be used in making the paper. This fibrous material should contain no or substantially no alkaline filler, or at least an amount so small that it may be rendered substantially completely chemically inert, as by the size precipitant used. This fibrous material may consist of any suitable papermaking fibrous stock, but obviously should contain substantially no machine broke from a machine utilizing alkaline filler, nor any waste paper in which alkaline filler has been employed. This furnish may preferably consist of new fibrous material, that is, fibre which has not already been previously made into paper such as sulphite, soda, or sulphate pulp, or the like, or it may contain reworked stock such as old papers in which there is substantially no alkaline filler content. To this fibrous material is added size, for example rosin size, and size precipitant, for example alum. After sufficient treatment in the beater the sized fibrous mix is dumped into a chest if desired, then put through a jordan engine, and from the jordan engine the mix may be delivered to the mixing box of the paper machine where it meets the fibrous mix containing alkaline filler prepared as in the first system above. These two fibrous mixes now combined into one are delivered on to the web-forming device of the paper machine and sized paper filled with alkaline filler results therefrom.

It might be anticipated that if a relatively small portion of sized fibrous mix were mixed with a relatively large portion of substantially unsized fibrous mix, and paper made therefrom, the resulting paper would not be uniformly sized, owing to the fact that only a relatively few of the fibres had sizing actually deposited upon them.

I have discovered by experiment, however, that such is not the case, but that a satisfactorily uniform sizing (as indicated by flotation on aqueous ink) may be obtained in a sheet in which sizing is deposited even on only a relatively minor portion of the fibrous material. It is thus seen that the addition of a sized fibrous mix to a substantially unsized fibrous mix will produce a satisfactorily sized sheet.

The proportion to be used of sized fibre coming from the second system to substan-

tially unsized fibre delivered from the first system is dependent upon the individual circumstances in any given case. I have found it possible to use as little as 5 per cent. of sized fibre and 95 per cent. unsized fibre and still obtain satisfactory results. Moreover I do not limit myself to the 5 per cent. as the minimum, as in certain cases it may be desirable to use even less than 5 per cent. of sized fibre.

However where circumstances permit, I prefer to use as large a percentage of sized fibre in proportion to the unsized fibre as is feasible. This is advantageous especially from the standpoint of foaming. For example the amount of sizing to be used in making the sized fibre mix must necessarily be sufficient to provide sizing for the entire sheet, in the case where the remainder of the fibre is substantially unsized. Thus for example if 2 per cent. of sizing, for example rosin size precipitated by alum, were desired to be used on the weight of the combined fibrous mixes from systems one and two, if only 5 per cent. of the fibre were to be sized, this fibre would have to be sized with the amount of sizing sufficient for the combined mix, or 2 per cent. on the combined mix. Thus this 5 per cent. of fibre would have to be sized with 40 per cent of its weight of sizing. As is well known in the art, sizing fibre with high percentages of sizing, even far less than 40 per cent. by weight of the fibre, causes a very considerable amount of foam in the whole process of stock preparation, and later on the paper machine providing paper with such a high percentage of sizing is being made. For this reason I prefer to utilize a much higher percentage of sized fibre in the paper, for example, 20 per cent. or even more in certain cases, and in some instances I find it desirable to have the sized fibre constitute the major part of the combined mix. If 20 per cent. of the total fibre be used for the sized fibre and 2 per cent. of sizing on the weight of the combined furnish be desired, this would mean that the 20 per cent. portion of the fibre would be sized with 10 per cent. of sizing by weight, and hence would foam very much less in the stock preparation than would fibre sized with 40 per cent. by weight of sizing. However, even with 10 per cent. of sizing on the weight of this portion of fibre, foaming is apt to occur, and hence it is preferable in order to minimize foaming to give this portion of fibre appropriate mechanical treatment in the beater prior to the addition of the size. Then the beater roll may be lifted if desired, size such as rosin size added and circulated in the beater long enough to secure complete mixing and then size precipitant such as alum added, or of course, the order may be reversed if desired. I prefer to add size precipitant in excess, such as is the normal custom in sizing fibre.

It will be apparent that a portion of the sizing will be introduced into the earlier part of the first system, i. e. the alkaline filler system, by the ordinary course of events in the papermaking operation. For instance wet and dry broke from the paper machine containing sizing, is normally introduced into the beater of the first system. As explained above, such sizing as is introduced at this point will be deteriorated if not completely destroyed by the action of the alkaline filler. Likewise the sizing containing material recovered from the white water is normally introduced into the first system in the concentrated stage and remains there for a considerable time; also any trim from the paper machine wire in addition to the other contents of the couch pit, particularly the concentrated paper web resulting from a wet end break, all sizing-containing material, will normally be introduced either continuously or intermittently usually to one of the stock chests; and the sizing therein thus will be subjected to deterioration or destruction by the alkaline filler.

However inasmuch as ordinarily 80 to 90 per cent. or more of the mix fed to the web-forming device is made into paper immediately, at least about 80 per cent. of the sizing being incorporated into the paper will not be subject to attack by the alkaline filler. Therefore it may be stated that the percentage of the sizing which may thus be returned to the unsized part of the system would at a maximum not be over approximately 20 per cent., and in many cases the percentage would be much less. Now for example if 2 per cent. sizing based on the combined furnish of the two systems is used, 20 per cent. of this or approximately 0.4 per cent. sizing might be introduced into the earlier part of the first system. This sizing will be deteriorated even to the point of destruction by the action of alkaline filler. However as disclosed in my copending application Serial No. 304,168 filed September 5, 1928, deteriorated or destroyed sizing may be restored in a fibrous mix which contains an alkaline filler by the addition of a restoring agent, such as acidic material for example alum, at the wet end of the paper machine. The fibrous mix of the first system when it reaches the mixing box may thus contain a certain amount, say for instance in the case cited 0.4 per cent., of deteriorated or destroyed sizing. When this fibrous mix from the first system is combined with the sized fibrous mix from the second system containing preferably an excess of alum, this excess of alum acts to restore the deteriorated or destroyed sizing present in the first mix, and thus this restored sizing functions to impart sizing in the paper produced. The paper therefore in such case will be sized chiefly from the undeteriorated sizing from the sec-

ond system, but in minor degree from the restored sizing of the first system.

There are several variations of my invention which may be employed satisfactorily. One of these is to dispense with the use of a jordan in the second system, by merely beating and sizing the fibrous mix, delivering it first to a chest and from there directly to the mixing box of the paper machine. This of course introduces unjordaned fibre into the paper, but under some conditions this is entirely satisfactory, while under other conditions it may be compensated for by a more complete jordaning of the fibrous mix of the first system.

Another variation may be used in the case where the jordan is placed subsequent to the machine chest in the first system. In this case the beaten sized mix from the second system may be introduced just prior to the jordan of the first system and mixed at that point with the first system fibrous mix, the combined mix jordaned and then delivered directly from the jordan to the mixing box of the paper machine. While this is not my preferable procedure because of the greater attack of the alkaline filler on the excess precipitant and the sizing in the sized fibrous mix, in certain instances where no unjordaned stock is desired in the paper, this may be employed to advantage.

A third variation which may be conveniently used is to employ a large or even the major portion of the fibrous material in the second system to give sized fibre, and employ in the first system the remainder of the fibrous material, which may if desired be previously worked fibrous material such as reworked old paper stock and/or reworked broke. This latter will be the fibrous material with which to mix the alkaline filler. For example in a furnish which would ordinarily contain sulphite pulp, soda pulp, old paper stock, broke, and alkaline filler, the sulphite and soda pulps may be used in the second system, and the remainder in the first system. The reworked old paper stock (deinked and/or bleached if desired) and the reworked broke without subjecting them to any beating operation, may be defibred separately if desired and mixed in a suitable container with the alkaline filler. If sweetener stock is used in the excess white water recovery system, this mix may be suitably employed as the sweetener stock and after so functioning, the sweetener stock may be returned to this mix. This fibrous mix which is from the first system may then be lead to the mixing box of the paper machine where it meets the sized fibre mix of the second system previously jordaned. As will be noted the first system mix, containing alkaline filler added as such (i. e. previously unassociated with fibre), and the wastes from the paper machine containing alkaline filler, requires little if any further mechanical treatment after defibring, because it has been beaten and jordaned in its original manufacture, and hence can be employed directly with the sized mix of the second system at the mixing box of the paper machine if desired, without further beating and/or jordaning. In certain cases, as will be seen, this results in great economy of power, as it permits the utilization of the reworked old stock without beating or jordaning. It also is advantageous in that the beating and jordaning apparatus ordinarily utilized in connection with a paper machine may be employed for the mixing and treating of the second system mix, i. e. the sized mix, and no other beating or jordaning equipment need be used for handling the first system mix, but only some sort of a mixing device in connection with a chest if desired.

My invention may be used as described above, or in connection with the inventions disclosed in one or more of my copending applications in which one or more materials are added at the wet end of the paper machine such for example as an alkaline filler, size, size precipitant, acidic material such as alum, sodium silicate, precipitated sodium silicate, starch, wet wastes returned from the paper machine, and the like.

A combined method which is particularly satisfactory is one in which alkaline filler is added to the fibrous mix of the first system at the wet end of the paper machine instead of (or in conjunction with) addition in the beater. It is added conveniently at approximately the same time as the sized fibre is added.

A restoring agent, for the deteriorated size which may be present in the first system mix, may be added at the wet end of the paper machine. In such case an excess of size precipitant in the second system mix may be dispensed with if desired.

Where previously precipitated sodium silicate is employed, it may suitably be prepared as such by precipitating this material preferably in conjunction with the size on the fibrous material of the second system.

In the practice of my invention, it is desirable to have suitable stock controlling devices so that weight variations in the paper will be reduced to a minimum. It is also desirable to have a device provided whereby in the case of a wet end break the flow of the sized fibrous mix to the mixing box may be temporarily interrupted in order that an undue amount of sized fibre will not accumulate in the couch pit. When the web is again ready to be fed into the driers the flow of the sized fibre may be immediately turned on.

It is not essential in the practice of my invention to return all or any of the wet machine wastes or the dry broke to the beater or other point of the first system. They may

if desired be utilized otherwise, as in the furnish of another paper machine. In such case the first system fibrous mix may contain substantially no sizing, the sizing being supplied wholly by the second system fibrous mix.

On the other hand, additional sizing may if desired be incorporated into the first system fibrous mix, but my preferable procedure is to supply no extra sizing as such to the first system but to supply substantially all of the sizing (with the exception of the restored sizing, if any) to the combined mix from the sized substantially alkaline filler free fibrous mix of the second system.

As a size precipitant and/or restoring agent in place of alum, I may use with a measure of success an acidic material such as sulphuric acid (H_2SO_4), an acid salt such as sodium bisulfate ($NaHSO_4$), or other metallic compounds such as zinc salts, iron salts, or other compounds of aluminum. Of the aluminum salts available I may use the chloride or the like, but I prefer to use ordinary "alum."

In place of rosin size I may use satisfactorily in the practice of my process any other size suitable for sizing paper. Examples of such sizes are soaps, such as the oleates, or any other size derived by treatment with an alkaline substance or the like from material originally of acid characteristics or from other material which likewise is of a partially or completely saponifiable nature, such as saponified beeswax. Suitable emulsions may also be employed.

By the term "alkaline filler" I mean substantially water insoluble filler which when agitated in contact with freshly boiled distilled water, say for an hour, will impart a pH value to such water greater than 7.0, that is, which will be on the alkaline side of the neutral point. Among fillers included in this group may be mentioned calcium carbonate, of which lime mud from the causticizing process is one form; calcium carbonate magnesium basic carbonate employed in the paper disclosed in my U. S. Patent No. 1,595,416, issued August 10, 1926; calcium carbonate magnesium hydroxide disclosed in my U. S. Patent No. 1,415,391, issued May 9, 1922; and other substantially water insoluble normal or basic carbonates of alkaline earth metals (which expression is herein intended to include magnesium), or compounds, double salts, or physically associated mixtures of these with one or more other acid soluble materials of a substantially water insoluble nature.

By the term "wet end of the paper machine" is intended to be included those instrumentalities employed in paper manufacture by which and/or in which a relatively concentrated paper mix is diluted, and treated, conveyed or fed up to the point of web formation, such as the mixing box, regulating and proportioning devices, rifflers, troughs, screens, headboxes, inlets, and the like, including also instrumentalities used in the white water cycle.

When I use the term "rosin size" it is to be understood that I mean to include any material produced by the action of an emulsifying agent, or solvent such as alkali generally in aqueous solution, on rosin, or on natural or synthetic resin acid or acids, regardless of the exact composition of the product or the varying composition which different samples may possess.

When I use the word "paper" herein, I use it in the broad sense to include products of manufacture of all types and of all weights and thicknesses, which contain as an essential constituent a considerable amount of prepared fibre and which are capable of being produced on a Fourdrinier, cylinder, or other forming, felting, shaping or molding machine.

While I have described in detail the preferred embodiment of my invention, it is to be understood that the details of procedure, the proportions of ingredients, and the arrangement of steps may be widely varied without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. The method of manufacturing sized paper filled with alkaline filler which comprises sizing fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

2. The method of manufacturing sized paper filled with alkaline filler comprising calcium carbonate, which comprises sizing fibrous material, mixing the resulting product with other fibrous material and calcium carbonate under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

3. The method of manufacturing sized paper filled with alkaline filler comprising calcium carbonate and magnesium compound, which comprises sizing fibrous material, mixing the resulting product with other fibrous material and calcium carbonate and magnesium compound under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

4. The method of manufacturing sized paper filled with alkaline filler comprising calcium carbonate magnesium hydroxide,

which comprises sizing fibrous material, mixing the resulting product with other fibrous material and calcium carbonate magnesium hydroxide under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

5. The method of manufacturing sized paper filled with alkaline filler which comprises mixing size and size precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

6. The method of manufacturing sized paper filled with alkaline filler which comprises mixing rosin size and size precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

7. The method of manufacturing sized paper filled with alkaline filler which comprises mixing size and alum in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

8. The method of manufacturing sized paper filled with alkaline filler which comprises mixing rosin size and alum in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

9. The method of manufacturing sized paper filled with alkaline filler which comprises mixing rosin size, sodium silicate and a precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

10. The method of manufacturing sized paper filled with alkaline filler which comprises mixing size and excess of size precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

11. The method of manufacturing sized paper filled with alkaline filler which comprises mixing size and size precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler under conditions favoring the minimizing of the time and intimacy of contact of the ingredients of the combined mix, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

12. The method of manufacturing sized paper filled with alkaline filler which comprises mixing size and size precipitant in the presence of fibrous material, mixing the resulting product with other fibrous material and alkaline filler at the wet end of the paper machine, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

13. The method of manufacturing sized paper filled with alkaline filler which comprises mixing alkaline filler and a portion of fibrous material, sizing a separate portion of fibrous material, combining the alkaline filler fibrous mix with the sized fibrous material at the wet end of the paper machine, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

14. The method of manufacturing sized paper filled with alkaline filler which comprises mixing alkaline filler, a portion of fibrous material, and returned material originating from a paper machine producing sized paper filled with alkaline filler, sizing a separate portion of fibrous material, combining the first mix with the sized fibrous material at the wet end of the paper machine, passing said combined mix on to a web-forming device, and thereafter making paper therefrom.

15. The step in the process of manufacturing sized paper filled with alkaline filler comprising the addition of previously sized fibre to a paper mix containing alkaline filler at the wet end of the paper machine.

16. The step in the process of manufacturing sized paper filled with alkaline filler comprising the addition of previously sized fibre and acidic material to a paper mix containing alkaline filler at the wet end of the paper machine.

17. The step in the process of manufacturing sized paper filled with alkaline filler comprising the addition of previously sized fibre and alum to a paper mix containing alkaline filler at the wet end of the paper machine.

18. The step in the process of manufactur-

ing sized paper filled with alkaline filler comprising the addition of previously sized fibre containing substantially no alkaline filler to a paper mix containing alkaline filler at the wet end of the paper machine.

19. The step in the process of manufacturing sized paper filled with alkaline filler comprising adding acidified sized fibre containing substantially no alkaline filler to a paper mix containing alkaline filler at the wet end of the paper machine.

20. The step in the process of manufacturing sized paper filled with alkaline filler comprising adding sized fibre, said fibre containing substantially no alkaline filler, and alum to a paper mix containing alkaline filler at the wet end of the paper machine.

21. The method of manufacturing sized paper filled with alkaline filler comprising separately preparing two fibrous mixes, one containing more sizing than the other, the other mix containing alkaline filler, combining said mixes at the wet end of the paper machine, passing the combined mix on to a web-forming device, and thereafter making paper therefrom.

22. The method of manufacturing sized paper filled with alkaline filler comprising separately preparing two fibrous mixes, one sized and the other containing deteriorated sizing and alkaline filler, combining said fibrous mixes under conditions favoring the minimizing of the time of contact of said fibrous mixes and favoring the restoration of said deteriorated sizing, running the combined mix on to a web-forming device, and thereafter making paper therefrom.

23. The method of manufacturing sized paper filled with alkaline filler comprising separately preparing two fibrous mixes, one sized and the other substantially unsized and containing alkaline filler, combining said fibrous mixes under conditions favoring the minimizing of the time of contact of said fibrous mixes, running the combined mix on to a web-forming device, and thereafter making paper therefrom.

24. Sized paper filled with alkaline filler thereby characterized that the fibrous material thereof contains two groups of fibres in substantially uniform mixture, the fibres of one group being substantially sized and the fibres of the other group being substantially unsized.

25. Sized paper filled with alkaline filler thereby characterized that the fibrous material thereof contains two groups of fibres in substantially uniform mixture, the fibres of one group being more highly sized than the fibres of the other group.

In testimony whereof I affix my signature.

HAROLD ROBERT RAFTON.