UNITED STATES PATENT OFFICE.

JAMES E. BAUM, JR., OF CHICAGO, ILLINOIS.

PAPER.

1,230,095. Specification of Letters Patent. Patented June 19, 1917.

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To all whom it may concern:

Be it known that I, JAMES E. BAUM, Jr., a citizen of the United States, and resident of Chicago, county of Cook and State of Illinois, have invented an Improvement in Paper, of which the following is a specification.

The object of my invention is to provide an improved paper having its surface coated or otherwise formed with a special compound which will enable the calendered paper to have a very smooth, dead or "flat" finish making it beautiful in texture, capable of receiving printed impressions from half-tone work of the finest mesh, and restful to the eyes when employed in books and reading matter generally.

Heretofore, it has been customary to coat the paper with a filler or loading of kaolin, known as pipe clay and china clay, the same being essentially silicate of alumina. In practice, these substances have been dissolved in water and with animal sizing or casein to the consistence of a creamy liquid, with or without coloring matter and applied to the surface or surfaces of the paper and, after drying, subjected to calendering to give finish. Such papers, while having a fine finish, have a very high luster or gloss and hence are more or less objectionable for many uses.

In some cases the paper stock in the beaters is "loaded" with the filler which is beaten up and incorporated with the paper stock being treated before it is fed to the paper mill proper. The loading material in these cases has usually been sulfate of lime and kaolin and sometimes infusorial earth, but the finished paper in these cases as in the other, receives more or less gloss when passed through the calendering rolls.

I have found that, if the paper web is coated or loaded with relatively pure silica, (that is, uncombined and hence differing from silicates) such as produced as an impalpable powder from pulverized white sand or quartz (which may be produced in a tube mill), associated with a suitable binder or size, the surface of the calendered paper may be of a smooth dead or "flat" finish, capable of receiving perfect imprints from the finest half-tone engravings and imparting the most artistic effect to the printed matter.

In carrying my invention into practice, the paper web may be coated with my improved filling or coating compound, then dried and calendered; and if the paper is to have a similar finish on both sides the web is subjected to a second coating, upon the opposite side, then dried and calendered. It is manifest, that, if desired, the two coatings and dryings may be done before any calendering. So far as these steps are concerned, any of the usual procedures may be followed and conducted with the machinery and appliances in common use.

The coating material or compound consists essentially of silica in such fine subdivision as to be "air-floated", "water-floated" or impalpable and hence substantially free from grit, associated with sufficient water and animal size or casein to give a creamy liquid consistency which may be easily applied to the traveling web of paper. This is usually applied by the present methods in use when using the kaolin compounds, and hence no detailed description of the apparatus will be necessary.

After the paper web has been coated on one side, it is conveyed through the drying room in loops by traveling bars, as customary; and when dried, the web is passed through the calendering rolls.

In some cases the coating is only upon one surface of the web, but if both sides of the paper are to be coated, then, before or after the calendering operation, the dried paper web is returned and subjected to a coating operation on its other side, or the operation may be continued with a second set of coating and drying apparatus. After the second coating, the paper web is subjected to the calendering operation and is then ready for the market.

If white sand (uncombined) is employed in the preparation of the silica powder, the coating compound will give a very white finish, but this may be varied to suit any color or tint desired by incorporating into the creamy liquid the coloring matter desired. It is also evident that a colored sand, such as contains oxid of iron, might be used to provide a pale yellow or ocher tint, and in such case no additional coloring matter than the iron present need be added.

It will be understood that, while the most satisfactory results for a "dead" or "flat" finish are to be obtained by employing the silica powder unmixed with other coating compounds (other than the water and binder or size), I do not confine myself in

this respect. I may mix any desired quantities of kaolin or other powdered material, suitable for coating, with the powdered silica and thereby obtain varying degrees of surface finish between "flat" finish and "gloss," a capacity which has not heretofore been accomplished in a high class of coated paper. By this combination, I may put a sufficient quantity of the coating compound upon the paper to give the finest printing results and yet regulate the reflecting finish of the paper to that required, instead of having to use a less amount of coating as heretofore, when a high gloss is not to be given to the paper.

I also desire it to be understood that the finely powdered uncombined silica may be employed with the sizing in the paper stock before being fed to the fourdrinier of the paper making machine, in which case the silica will constitute a "loading" or give body to the fiber of the stock; and if the "loading" is in sufficient quantity, the calendered paper so made may be employed without the additional surface coating above described. Broadly considered, my invention comprehends the incorporation with the paper of the silica powder held in place by a suitable size or binder, whether this is accomplished simply as a coating or incorporated into the body as "loading" and applied to the paper stock in the beating engine, or otherwise, preliminary to the formation of the web.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. As an article of manufacture, paper in sheet or web form having a coating of uncombined silica in a state of impalpable powder.

2. As an article of manufacture, paper in sheet or web form having a coating of uncombined silica in a state of impalpable powder, and a binder by which the silica particles are held closely together and to the paper fibers to provide a smooth surface.

3. As an article of manufacture, paper in sheet or web form coated with a compound composed essentially of silica in a state of impalpable powder mixed with clay in such proportions as to impart a moderate degree of gloss and a very smooth surface.

4. As an article of manufacture, paper in sheet or web form coated with a compound composed essentially of uncombined silica in a state of impalpable powder mixed with a coloring matter and sufficient size to act as a binder between the materials and with the fiber and form a very smooth surface.

5. As an article of manufacture, paper having its fiber associated with impalpable powder of uncombined silica, and calendered to a smooth surface.

6. As an article of manufacture, paper in sheets or web form having its surface provided with an impalpable powder of uncombined silica held in place by size, and calendered to a smooth surface.

In testimony of which invention, I hereunto set my hand.

JAMES E. BAUM, JR.

Witnesses:
R. M. HUNTER,
FLORENCE DEACON.