4 Sheets—Sheet 1.

H. ALLEN & L. S. MASON.

Apparatus for Preparing Paper Pulp.

No. 196,965. **Patented Nov. 13, 1877.**

FIG. 1.

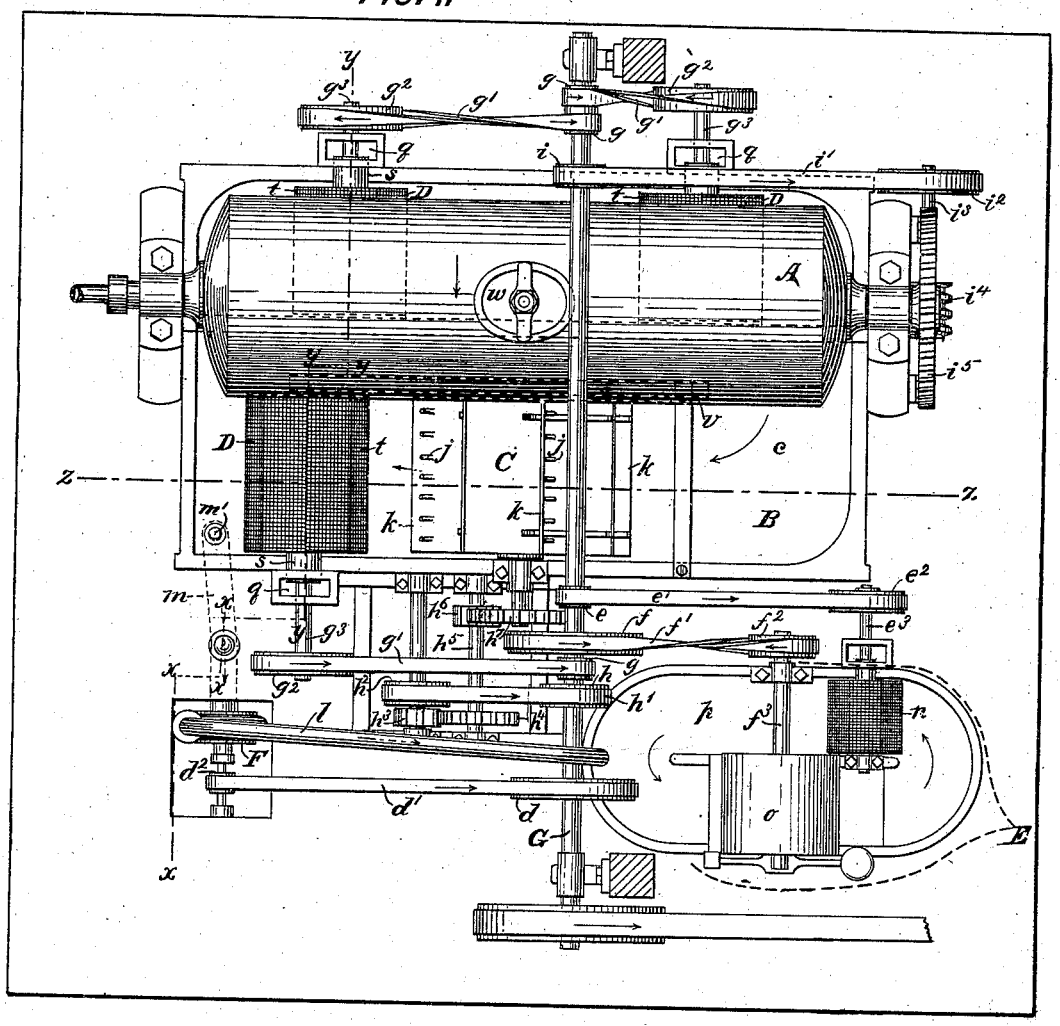

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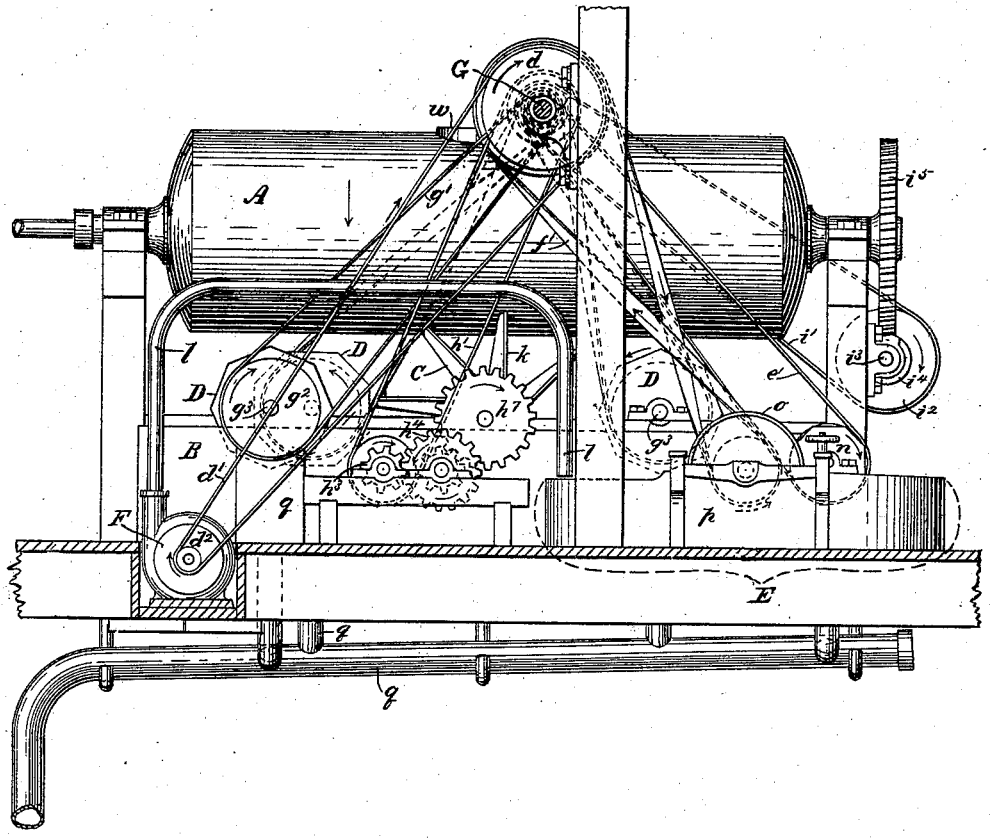
FIG. 2.



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Apparatus for Preparing Paper Pulp.

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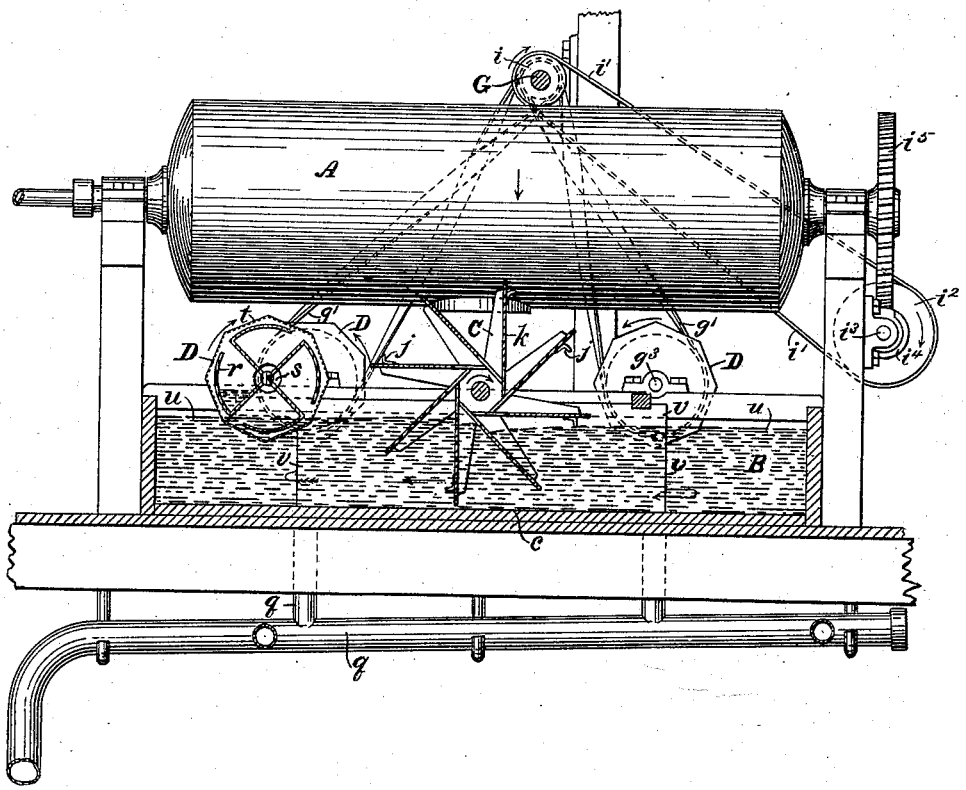
FIG. 3.



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4 Sheets—Sheet 4.

H. ALLEN & L. S. MASON.

Apparatus for Preparing Paper Pulp.

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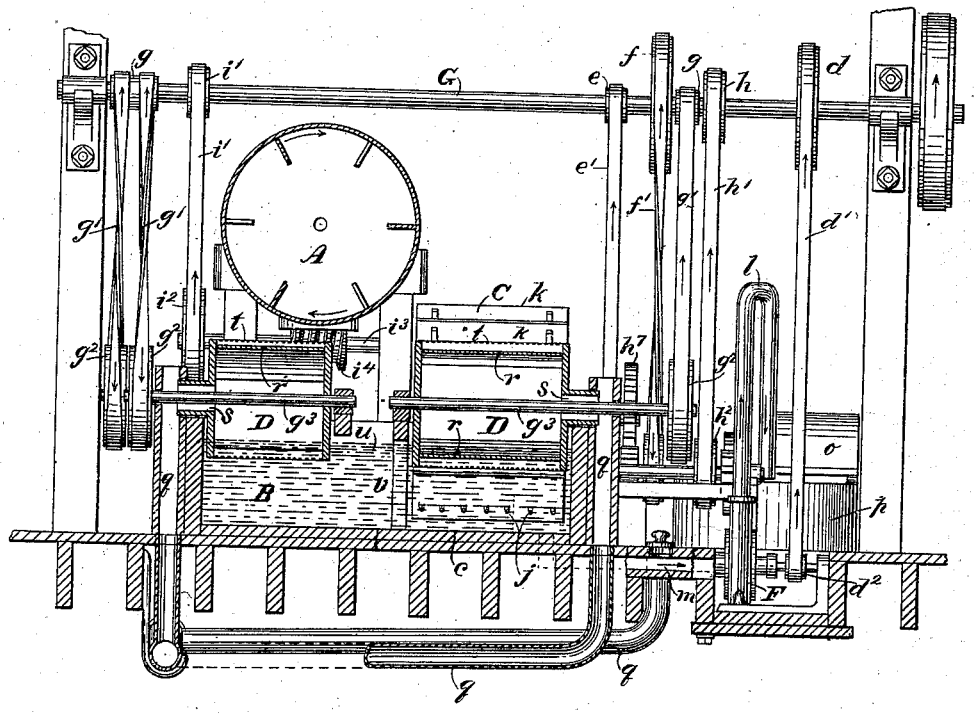
FIG. 4.



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UNITED STATES PATENT OFFICE.

HIRAM ALLEN AND LYMAN S. MASON, OF SANDY HILL, N. Y., ASSIGNORS TO SAID HIRAM ALLEN AND LOREN ALLEN, OF SAME PLACE.

IMPROVEMENT IN APPARATUS FOR PREPARING PAPER-PULP.

Specification forming part of Letters Patent No. **196,965**, dated November 13, 1877; application filed February 23, 1877.

To all whom it may concern:

Be it known that we, HIRAM ALLEN and LYMAN S. MASON, each of Sandy Hill, in the county of Washington and State of New York, have jointly invented a new and useful Improvement in Apparatus for Preparing Paper-Pulp from printed and written paper and other suitable stock, which invention is described and set forth in and by the following specification and accompanying drawings, in which—

Figure 1 is a plan of one form of our improved apparatus; Fig. 2, a side elevation of the same; Fig. 3, a partial elevation and a section of the same at or about the line *z z* in Fig. 1; and Fig. 4, a partial end elevation and a section of the same at or about the lines *y y x x* in Fig. 1.

Like parts are marked by like letters in the different figures, and the arrows therein indicate the directions in which the parts move.

In the aforesaid drawings, A is a boiler, which is to be of the ordinary or any suitable kind used for treating paper-stock therein with alkalies or chemicals and steam from any suitable generator, as usual in paper-mills. B is a fixed vat of greater capacity than the boiler A, and arranged under the latter, so that by opening the man-hole *w* in the boiler, and revolving the latter, the treated paper-stock will be discharged from the boiler through the man-hole into the vat.

For economy of room and efficiency and directness of operation we generally prefer to have the boiler A rotary, and directly over the vat B; but, as regards this invention, the boiler may be located higher than and at one side of the vat B, and with the man-hole *w* over any suitable inclined conductor leading into the vat, so that the contents of the boiler shall, by their own gravity, be automatically discharged through the man-hole and conductor into the vat upon slowly turning the boiler when the man-hole is open.

The vat B has a partial partition, *v*, so that the interior of the vat is in the form of a circuit or continuous passage for the water *u*, which is to be supplied to the vat, as shall be required, by a hydrant, pump, or any suitable means.

C is a paddle-wheel arranged in the vat B, and across the circuit-passage therein, so that the rotation of the wheel shall cause a continuous flow of the water throughout the circuit of the vat.

D is a rotary strainer, separate from the wheel C, and arranged in and across the upper part of the circuit-passage in the vat B, so as to draw off the soiled water from the vat without permitting the paper-stock to escape. One, two, three, or more of the rotary strainers may be used in the vat, as shall be preferred. Each of the strainers D is essentially the same as that commonly used and called the "washer" in the ordinary beating-engine, by which paper-stock is generally washed and reduced to pulp suitable for paper. Each of the rotary strainers has a surrounding fine-wire screen, *t*, which will not let the paper-stock pass through, but will allow the soiled water to run into the interior, where the water is raised into a central discharge-passage, *s*, Figs. 3 and 4, by buckets *r*, secured to and revolving with the screen. The soiled water thus discharged is to be conducted away by any suitable passage or passages, *g*.

E, Fig. 1, represents a common pulping-engine, having the circuit-vat *p*, roll, and bed armed with blades under the cover *o*, and the rotary strainer or washer *n*, all substantially the same as in the ordinary engine commonly used in reducing paper-stock or "half-stuff" into pulp suitable for paper.

F indicates a pump, of any suitable construction, which communicates with the lower part of the vat B by a pipe or passage, *m*, furnished with a stop valve or plug, *m'*, and which pump also communicates, by a pipe, *l*, with the vat *p*, so that the pump F can transfer the washed paper-stock suspended in water from the washing-vat B into the vat *p* of the pulping-engine.

On the paddles *k* of the wheel C are projecting fingers, hooks, or pins *j*, arranged so that as the wheel revolves the thread, strings, and strips of cloth, which often occur in stock from old paper, will be caught and separated from the paper-stock by the pins, hooks, or fingers, and from the latter the accumulations of threads, strings, and strips of cloth can be oc-

casionally removed by hand as the wheel revolves.

We generally prefer to make the wheel C with its paddles *k* inclined to its radii and to its direction of motion, and to have the outer edges of its paddles turn close to or near the bottom *c* of the vat, all substantially as indicated in Fig. 3, in order that the paddles shall not lift out the paper-stock in rising out of the water, while they at the same time effectually stir up and mix the paper-stock with the water, and insure the proper circulation of the same past the rotary strainer or strainers.

In carrying out this invention any suitable devices are to be used in giving the necessary movements to the several parts from any suitable motor or motors.

In the drawings, G is a rotary shaft, from which rotary motion is communicated, as indicated by the arrows, to the boiler A by the pulley i, belt i^1, pulley i^2, shaft i^3, worm i^4, and worm-wheel i^5; to the wheel C by the pulley h, belt h^1, pulley h^2, pinion h^3, spur-wheel h^4, shaft h^5, pinion h^6, and spur-wheel h^7; to the rotary strainers D by the pulleys g, belts g^1, and pulleys g^2, fast on the shafts g^3 of the strainers, respectively; to the beating-roll of the pulping-engine E by the pulley f, belt f^1, and pulley f^2, fast on the shaft f^3 of the beating-roll; to the strainer n by the pulley e, belt e^1, and pulley e^2, fast on the shaft e^3 of the strainer; and to the rotary pump F by the pulley d, belt d^1, and pulley d^2.

In ordinarily using the apparatus above described the printed paper or other stock is submitted to the action of an alkaline or suitable chemical solution and steam in the boiler A, in the manner heretofore commonly practiced in making paper-pulp from like materials.

At the completion of the treatment of the paper-stock in the boiler the vat B is partly filled with water, and the man-hole *w* of the boiler is opened, so that the treated paper-stock will be discharged from the boiler into the water in the vat.

The wheel C is at the same time revolved, and thereby produces a current in the water, and causes the mixture and suspension of the paper-stock therein, and drives the same past the rotary strainer or strainers D, by which the soiled water is drawn off from the vat, while clean water is supplied thereto by a hydrant, pump, or other suitable means.

This action of the wheel C and strainer or strainers D is continued until the paper-stock is sufficiently washed. Then the supply of water to the vat B is stopped, and the rotation of the wheel C and strainer or strainers D is continued until the contents of the vat are of suitable consistency to be bleached, or to be transferred to the pulping-engine. Then, if the washed paper-stock is to be bleached or partly bleached before being reduced to pulp, a suitable quantity of the bleaching-liquid is to be mixed with the paper-stock in the water in the vat B, and the whole left in the vat until the pulping-engine E shall be ready to be supplied, whereupon a sufficient portion of the washed and partly bleached or unbleached paper-stock held in suspension by the water in the vat B by the rotation of the wheel C is transferred by the pump F into the engine E, by which latter the paper-stock is reduced into pulp suitable for paper.

In case the engine E shall be empty when the paper-stock is being received into the vat B from the boiler A, or when the paper-stock has been only partially washed in the vat, and it shall then be desired to have the engine in operation, the pump F is then to be put in motion, with the passage *m l* open, and thus made to transfer a suitable portion of the slightly or partly washed paper-stock, suspended in water, from the vat B into the engine E, which latter will then be used, in the manner commonly practiced in paper-mills, to first wash the paper-stock and afterward reduce the same into pulp suitable for paper.

It will be observed that if, while the treated paper-stock is being discharged from the boiler A, through the passage *w*, into the vat B, suitably supplied with water, the wheel C, rotary strainer or strainers D, pump F, and engine E are then all in motion, with the passage *m l* open, the paper-stock will then be discharged from the boiler A into the vat B, and mixed with and suspended in the water in the vat by the wheel C, and thereby made to circulate past the strainer or strainers D, while a portion of the paper-stock thus suspended in the water will be transferred, by the pump F and passage *m l*, into the pulping-engine E, all by the automatic operation of the apparatus.

The transfer of the suspended paper-stock from the vat B into the engine E can be stopped by stopping the motion of the pump F, or by closing the pipe *m* by the valve or plug *m'*, which latter serves to prevent the accumulation of masses of the pulp in that pipe while the suspended paper-stock is not being passed from the vat B into the engine.

The above-described combination of the boiler, with its discharge-passage, circuit-vat B, supplied with water, rotary strainer or strainers D, and current-producing wheel in the vat, and mechanism by which the boiler, current-producing wheel, and strainer or strainers are revolved, is of great importance, for thereby the boiler delivers the treated paper-stock automatically into the water in the circuit-vat, and thus saves much time and labor otherwise necessary in the transfer, and simultaneously prevents the escape into the atmosphere in the mill of much steam and deleterious vapors from the hot-treated paper-stock; and at the same time the wheel produces throughout the water in the vat a strong circuit-current, which prevents the piling up in the vat of the paper-stock as it is gradually received from the boiler, and causes the immediate mixture and suspension of the paper-stock in the water, and the simultaneous circulation of the same

against and past the rotary strainer or strainers, by which the soiled water is at the same time drawn off.

By the combination of the circuit-vat B, wheel C, strainer or strainers D, pulping-engine E, pump F, and passage *m l*, and mechanism by which the current-producing wheel, strainer or strainers, pump and pulping-engine are actuated, as hereinbefore described, the wheel C will not only mix the paper-stock with and cause its suspension in the water in the vat, and the circulation of the same past the strainer or strainers, whereby the paper-stock will be washed and the soiled water removed, but the wheel C will also keep the paper-stock mixed with and suspended in the water while the pump F transfers the same through the passage *m l* into the engine E, by which the paper-stock is reduced into pulp suitable for paper; and thereby inky or soiled paper-stock can be washed and reduced to pulp for paper at a cheaper rate than by the ordinary means heretofore used.

By having the vat B made with its bottom *c* level, and without any raised back-fall near the wheel C, or other raised obstruction on the bed, and the wheel C constructed with paddles, either radial or inclined, and extended from above or near the level of the top of the water in the vat to near the bottom of the latter, substantially as shown in the accompanying drawings, the wheel C will produce a suitable current in the mixed paper-stock and water, past the strainer or strainers D, and throughout the circuit of the vat, without materially obstructing the flow of the upper portion of such current; and, at the same time, the level unobstructed bottom *c* of the vat will permit such current to pass over it freely, while pieces of coal, stones, nails, pins, steel pens, and other injurious solid foreign matters that are common in old paper-stock will settle, and be left on the level or nearly level bottom *c* of the vat, away from the wheel C, where they cannot do harm, and can be easily removed upon emptying the vat.

By having the paddles *k* of the wheel C inclined to the radii and direction of rotation of the wheel, as shown in the drawings, in connection with the circuit-vat B, supplied with water, and having a substantially level unobstructed bottom, *c*, and the rotary strainer or strainers D, the paper-stock is thoroughly mixed with and suspended in the water in the vat, and is in that condition moved past the rotary strainers or strainer with a more even flow throughout the circuit and from top to bottom of the current, and with less lifting of the paper-stock out of the water, than can be effected in a circuit-vat having a part of its bottom raised high above the remainder, or with a paddle-wheel of like diameter, but with paddles arranged radially.

The projecting pins, hooks, or fingers *j* on the paddles *k* are of much importance in collecting and separating the threads, strings, and strips of cloth from the stock made from old books and other papers, in the operation of washing such stock by the strainer or strainers D, in the circuit-vat, whether the paddles are or are not inclined to the radii of the wheel.

What we claim as our joint invention is—

1. The combination of the boiler A, having the man-hole *w*, the circuit-vat B, supplied with water, of greater capacity than the boiler, and arranged below the latter, and furnished with the current-producing wheel C and rotary strainer D, and mechanism, substantially such as described, by which the boiler, current-producing wheel, and strainer are revolved, as set forth.

2. The combination of the circuit-vat B, supplied with water and furnished with the current-producing wheel C and rotary strainer D, the pulping-engine E, the pump F, with its connections *m l*, and mechanism, essentially such as described, by which the current-producing wheel, pump, and pulping-engine are actuated, as set forth.

3. The combination of the boiler A, having the discharge-passage *w*, the circuit-vat B, arranged under the boiler, supplied with water, and furnished with the current-producing wheel C and rotary strainer D, the pulping-engine E, the pump F, with connecting-passages *m l*, and mechanism, essentially as described, by which the boiler, current-producing wheel, strainer, pump, and pulping-engine are actuated, as set forth.

4. The combination of the vat B, (in the form of a circuit, supplied with water, and having the continuous, substantially level, unobstructed bottom *c*,) the wheel C, having paddles extending from about the level of the top of the water in the vat to near the bottom thereof, and the separate rotary strainer or strainers D, all arranged to operate as described.

5. The combination of the circuit-vat B, having the substantially level, unobstructed bottom *c*, the wheel C, having paddles *k* inclined to the radii and direction of rotation of the wheel, and the separate rotary strainer or strainers D, all arranged to operate as set forth.

6. The combination of a circuit-vat, B, current-producing wheel C, and fingers *j*, projecting from the outer portion of the paddles of the wheel, substantially as described.

In testimony whereof we hereunto set our hands in the presence of two subscribing witnesses this 15th day of February, 1877.

HIRAM ALLEN.
LYMAN S. MASON.

Witnesses:
J. H. VANDENBURGH,
GEO. A. FERRIS.