(1) பக்கங்களின் எண்ணிக்கை 86

(2) புதுக்கித் திருப்பிய நாள் ஜூலை 1993

(3) ஆதாரங்குறிப்பவர் சுருக்கொப்பம் 8/11/93

தமிழ்நாடு ஆவணக் காப்பகம்.

தமிழ்நாடு அரசு

பொதுப் பணித் துறை

அரசாணை எண். / மு. கோப்புத் தாள் எண். 563

அச்சகம் / பலவகை

நாள் : 2-3-1894 ~~19~~.

6/8/93

மடிக்கவோ கண்டபடி கையாளவோ கூடாது

ஆவண. கா-1—18,006—15-6-87.

28

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Account.

Read—the following paper :—

G.O., dated 22nd February 1894, No. 153, Financial.

Read—the following papers :—

Memorandum of the Public Works Department, dated 15th September 1893, No. 854 D.

Endorsement of the Public Works Department, dated 10th February 1894, No. 611-C., on letter from the Superintending Engineer, II Circle, dated 1st February 1894, No. 2587 K.S.

From the Superintendent of Stationery, Madras, dated 14th February 1894, No. 188.

With reference to your endorsement, No. 1656, dated 23rd September 1893, forwarding, for my remarks, the memorandum from the Public Works Department, No. 854 D., dated 15th September 1893 (herewith returned) requesting that paper for ferro-gallic process may be included in appendix A to the stationery rules as an article of supply to the Public Works Department, I have the honour to report as follows.

2. The Superintending Engineer, III Circle, states that the use of heliographic paper for copying plans has been found both economical and practical for every purpose. The materials required for the process for all the circles and the subdivisions of the Public Works Department are given in the margin and their value is estimated at Rs. 8,012-9-2. It appears that the first five articles valued at Rs. 6,766-13-0 will be required annually and the remainder valued at Rs. 1,245-12-2 once in 10 years only.

	RS.	A.	P.
Tracing vellum in rolls of 33 × 40 at Rs. 22 per roll, for 94 rolls ..	2,068	0	0
Ferro-gallic paper, black lines on white, roll of 20 yds. × 40 at Rs. 18 per roll, for 80 rolls	1,440	0	0
Marion's ferro-prussiate paper, roll of 20 yds. × 40 at Rs. 22 per roll, for 142 rolls ..	3,124	0	0
Gallic acid at 4s. per pound, for 40 lb. = 160 s.	130	2	8
Alum at 1s. for 7 lb., for 40 lb. $\frac{40}{7}$ s. ..	4	10	4
Total ..	6,766	13	0
Materials required once in 10 years—			
Sheet of plate glass, 1 felt and 1 frame 21½" × 27½" × ¾" at Rs. 15 for the lot, for 40	600	0	0
Tin developing dish 34" × 24" × 2¾" at Rs. 1-8-0 each, for 40	60	0	0
Zinc or vulcanite trough, imperial size, V shaped, 18s. each, for 40 = 720s. or £36.	585	12	2
Total ..	1,245	12	2
Total cost for the 1st year ..	8,012	9	2
For the succeeding 9 years the cost will be only	6,766	13	0

3. If the Government is pleased to sanction the introduction of this new process of copying plans, &c., I would suggest that the officers of the Public Works Department be required, after a trial of a year or two, to report on the practicability and advantage of the new process and the savings resulting therefrom.

4. The articles will be included in the next indent on the Secretary of State, which is due to Government on the 1st March next, and will be supplied to officers as soon as they are received from England.

5. As I have had to obtain some more particulars from the Public Works Department regarding estimates of quantities and value of the required materials, there has been some delay in submitting my reply to the above reference from Government.

Order—dated 22nd February 1894, No. 153, Financial.

The proposal to include in appendix A to the stationery rules all materials necessary for the ferro-prussiate and the ferro-gallic processes of copying plans as articles of supply to the Public Works Department is approved.

2. The attention of the Superintendent of Stationery will be drawn to the alteration as regards the size of glass proposed in the letter from the Executive Engineer, Kistna Western division, dated 24th January 1893, No. 626.

3. Arrangements will be made in the Public Works Department for the report referred to in paragraph 3 of the Honorable Mr. Austin's letter of the 14th February.

4. The Superintendent of Stationery will note the necessary corrections to be made in the stationery rules.

(True Extract.)

(Signed) L. DAVIDSON,
Ag. Assistant Secretary.

ORDER—dated 2nd March 1894, No. 563 W., Public Works.

Communicated to officers of the Public Works Department in continuation of No. 4022 C., dated 29th November 1893.

2. It will be seen that the materials for the new process will be included by the Superintendent of Stationery in his next indent on the Home Government and that the articles will in due course be distributed. Superintending Engineers will, after a year's trial, report on the success or otherwise of the new process and the savings resulting therefrom.

(True Extract.)

Major, R.E.,
Under Secy. to Govt., P.W.D.

To Superintending Engineers.
,, the Consulting Architect.
,, the Superintendent of Works, Periyár Project.
,, the Chief Engineer for Irrigation.

Exd. C. A. Munisawmy.
Spare Copies

GENERAL.
ACCOUNT.

Govt. of {1894} Madras.

PUBLIC WORKS.

Dated March, 2nd.

Recd. *Encl.*

G.O., 2nd Mar. 1894, No. 563 W.

MARCH.

Ferro-prussiate and ferro-gallic processes of copying plans

Proceedings, Financial Department, on correspondence relative to the adoption of the — in the Public Works Department, communicated to officers of the department with instructions that, after a year's trial, a report be submitted on the success or otherwise of the new process and the saving resulting therefrom.

34

PUBLIC WORKS DEPARTMENT.

No. 4022 C., dated 29th November 1893.

MEMORANDUM.

Read—the following papers :—

From W. P. AUSTIN, Esq., C.S., Superintendent of Stationery, to the Chief Engineer, Public Works Department, dated Madras, 27th September 1893, No. 1454.

With reference to the Proceedings of Government in the Public Works Department, No. 854 D., dated 15th September 1893, referred to me for remarks by the Financial Department, I have the honour to request that you will be so good as to furnish me with an estimate of the probable quantities and cost of the paper and other material which may be required annually for the whole of the Public Works Department for the adoption of the ferro-prussiate and ferro-gallic process of copying plans recommended in the above.

No. 981 D.

Copy of the above forwarded to the Superintending Engineer, III Circle, with reference to the correspondence ending with his letter No. 1323, dated 18th August 1893, and with a request that he will be so good as to frame an estimate of the materials which, in his opinion, should be obtained for supply to the department generally. The estimate should show the quantity to be issued to each office.

(Signed) J. HANNAN,
Ag. Chief Engineer, P.W.D.

5th October 1893.

To the Superintending Engineer, III Circle.

From Colonel A. T. FRASER, R.E., Superintending Engineer, III Circle, to the Chief Engineer, Public Works Department, dated Bellary, 11th November 1893, No. 2041.

In reply to your No. 3481 C., dated 27th October 1893, I have the honour to return the enclosed estimate of materials which seems correct.

2. I also forward Messrs. Thacker and Co.'s price list and directions for reference and would request their return.

3. In order to make the information more complete, I have embodied their directions on a sheet of memoranda on heliographic copying, which to save time is sent in original and may be of course retained as the "detailed instructions" to which your paragraph 2 refers.

ENCLOSURES.

ESTIMATE of materials required for the heliographic printing process.

—	Tracing vellum, roll 33 yards × 40 inches.	Ferro-gallic paper, black lines on white, roll 20 yards × 40 inches.	Marion's ferro-prussiate paper, roll 20 yards × 40 inches.	Gallic acid.	Alum.	Sheet of plate glass, 20 inches × 26 inches.	Piece of felt, 21½ × 27½ inches.	Frame, 21½ inches × 27½ inches and ¾ inch thick.	Tin developing dish 34 inches × 24 inches × 2¾ inches.	Vulcanite trough, Imperial size, V shaped.
	For one Superintending Engineer.									
Amount ..	(a) 1½ rolls 49½ yards	(a) 2 rolls 40 yards	(a) 1 roll 20 yards	(a) 1 lb.	(a) 1 lb.	(b) 1	(b) 1	(b) 1	(b) 1	(b) 1
	For one Executive Engineer.									
Amount ..	2½ rolls 82½ yards	2 rolls 40 yards	4 rolls 80 yards	1 lb.	1 lb.	1	1	1	1	1

—	Tracing vellum, roll 33 yards × 40 inches.	Ferro-gallic paper, black lines on white, roll 20 yards × 40 inches.	Marion's ferro-prussiate paper, roll 20 yards × 40 inches.	Gallic acid.	Alum.	Sheet of plate glass.	Piece of felt.	Frame, 21½ inches × 27½ inches and ¾ inch thick.	Tin developing dish, 34 inches × 24 inches × 2¾ inches.	Zinc or vulcanite trough, Imperial size, V shaped.
	For six Superintending Engineers.									
	(a) 9 rolls 297 yards	(a) 12 rolls 240 yards	(a) 6 rolls 120 yards	(a) 6 lb.	(a) 6 lb.	(b) 6	(b) 6	(b) 6	(b) 6	(b) 6
	For 34 Executive Engineers.									
	85 rolls 2,805 yards.	68 rolls 1,360 yards	136 rolls 2,720 yards	34 lb.	34 lb.	34	34	34	34	34
Total ..	(a) 94 rolls 3,102 yards	(a) 80 rolls 1,600 yards	(a) 142 rolls 2,840 yards	(a) 40 lb.	(a) 40 lb.	(b) 40	(b) 40	(b) 40	(b) 40	(b) 40

(a) For one year. (b) For 10 years.

MEMORANDA on the Heliographic process of copying plans.

This process allows of any number of copies being made from an original drawing (or a tracing made from one) on translucent vellum, with much less expenditure of labour and time than the single copy on tracing cloth or paper taken from an ordinary plan.

There are three different kinds of heliographic paper in the market, viz., *ferro-prussiate paper* giving white lines on a blue ground, *ferri-cyanide paper* (blue lines on a white ground), and *ferro-gallic paper* giving black lines on a white ground.

But the use of any one of these kinds requires the preparation first of a drawing in black lines on translucent vellum. This requires care if every line in the copy is to show up distinct. The vellum may be used like drawing paper for original plans, being easily drawn upon, or it may be made use of as tracing paper. The Indian ink must be rubbed up thick and the lines be drawn with as much boldness as the nature of the design will allow. When finished, the vellum must be held up to the light and any translucency in lines blackened out; else the print will be feeble at those places. To prevent flies settling and eating off the ink, sheets when finished should be put in a tin box or a portfolio. As colours cannot be printed, contrast of lines has to be relied upon to give plans relief and effect, especially survey maps, and this wants some training of draftsmen accustomed to make thin lines of uniform thickness and trust to colour for their better explanation. Much variety can, however, be obtained by shading in Indian ink all depths up to dense black and by hatching, dotting, and the like devices.

When a drawing (original or traced) has been prepared on vellum and examined for defects, all is ready for printing.

It is unnecessary here to describe the theory of the operation, because sensitive papers can be purchased ready for use and certain stock directions have only to be followed mechanically.

The easiest process of copying is by ferro-prussiate paper, Marion's ferro-prussiate paper being ready sensitized (white lines on a blue ground) and no chemical agents required, in rolls of 33 feet long and 39 inches wide. The printing apparatus consists of a sheet of thick plate glass 20 inches by 26 inches and ¾ inch thick, a piece of felt 21½ inches by 27 inches, and a flat wooden tray 21½ inches by 27½ inches and ¾ inch with a rim round two sides. This has been found sufficient in this country. But there are (see Fallowfield's Photographic Annual, 146 Charing Cross Road, W.) *box printing frames* procurable in which the progress of the print can be seen without disturbing its position. The size to take a sheet of imperial size 30 inches by 22 inches is priced £3-2-0 in London, but could be no doubt made up at less cost in the Madras workshops.

Using the wooden tray, all that is necessary is to lay the felt on the tray; place a piece of ferro-prussiate paper upon it, face upwards; upon that the sheet of vellum containing the drawing to be copied; and over all the sheet of plate glass. This should be done in a small room kept tolerably dark, or having yellow paper pasted over the window panes. The tray is then exposed to bright sunshine for ten minutes or more according to the sun's power. The exposure is sufficient when the colour of the ferro-prussiate paper is turned to an olive, to be ascertained by having a slight margin to the paper projecting beyond the drawing.

Then, in the darkened room, wash the print in clean water till the lines come out clear and hang the sheet up to dry.

In this manner any number of copies can be made in succession by an office muchi or peon. It is advisable to mount such as are of value, *e.g.*, contract and working drawings copied, on cheap calico.

Some authorities would prefer copies of plans in black lines on a white ground for reference, as white lines on a harsh blue ground are not very congenial to the eye, having to dwell upon them long. In this case resort can be had to *ferro-gallic paper* (in pieces of 20 yards length 40 inches wide, No. 13 medium paper, 19 per piece in London).

A drawing on vellum is prepared as before and laid over a sheet of ferro-gallic paper with the felt underneath and plate glass above.

The exposure takes from 5 to 10 minutes in the sun and from 15 to 60 minutes in diffused daylight.

The print has to be examined in the frame during exposure, and, when fully exposed, should appear white or very nearly white, the open margin of the print and the paper under the vellum showing little or no difference of tint. When that is the case, it has to be taken out and developed.

For developing a solution is made of 1 ounce of gallic acid and 1 ounce of alum to a gallon of water. The solution can be used for a day or two and for a succession of prints till it turns black.

In a large office the prints would be developed in zinc tray dishes some 34 inches by 24 inches and 2¾ inches deep.

But in small offices it would be more economical to use a tin or zinc trough of trapesoidal section, about 34 inches long and 5 inches deep, that width at top and 2¾ inches at bottom, and pass the paper through it backwards and forwards till developed.

After two or three minutes the print will appear in dark lines on a white ground, when it is removed and placed in a trough of clean water or laid on a slab of stone and water poured over it till a clean surface is obtained. The print must not be sponged.

Under-exposed prints will not show a white ground and the lines will be thick and woolly. Over-exposed prints will have fine and faint lines.

Any precipitate formed in making the developing solution must be decanted off and may be used in making up any fresh solution.

Ferri-cyanide paper (blue lines on a white ground) is more sensitive to light than the preceding and must be cut to size in a darkened room.

The exposure is made in the same way as before, but as it is of importance it should be correct. Test slips should be exposed at the same time as the print. From these slips a small piece is torn off when it is thought to have been long enough exposed. This is dipped into the developing solution. If it darkens rapidly the exposure is not sufficient; if, on the other hand, it shows but slight discoloration, the exposure must be stopped. The frame should be covered up or turned over during the test or it may be over-exposed. After some experience, the grey tone of the fully exposed print will be recognized and test slips become unnecessary.

The time of exposure according to the intensity of the light is—

In bright sunshine from 1 to 2 minutes.
Diffused daylight from 3 to 10 "
Dull weather from 10 to 30 minutes.

If the print is, after exposure, examined in a faint light, it will show a distinct but not a strong image of the tracing—yellow lines on grey ground—and by the appearances the right exposure can be easily judged when experience has been gained.

To compose the developing solution, ½ lb. of red and ⅛ lb. of yellow prussiate of potash (commercial samples) are dissolved in one gallon of hot water and let cool. The solution will keep indefinitely and may be used until exhausted. As soon as the lines are out clearly development should be stopped and the print flooded with cold water and then washed as in the directions for development.

To develop, the edges of the print should be turned up ½ an inch all round before removal from under the glass to prevent any of the developing solution getting on the back of the paper.

The print is then floated on the solution in a large zinc tray, say, 34 inches by 24 inches by 2¾ inches deep, and to ensure its getting to all parts of the surface the print is raised from time to time to examine its stage of development, which will take from one to two minutes. The drawing will soon appear in distinct bluish-green lines on a ground of yellowish green, after which the print is taken up carefully and washed in cold water or laid on a slab and water poured over it; thereupon a flat copying brush (or a sponge) is passed very gently over it till every trace of blue has vanished from the surface and dark blue lines stand clearly out upon a blue ground. After leaving the print to soak in the water for a few minutes, which may be once or twice renewed, it is hung up to dry.

It will be evident from the foregoing directions that Executive Engineers will find the use of ferro-prussiate paper most convenient for ordinary plans, and especially working drawings.

For plans to accompany important estimates requiring Government sanction, ferro-gallic copies prepared after the drawings on vellum had received final corrections might be used.

The advantage of ferri-cyanid paper would seem to be that, while giving dark blue lines on a white ground, it is rather more sensitive and requires shorter exposure than ferro-gallic paper.

It is obvious that all these heliographic papers must be carefully kept in tin cases out of influence of both damp and daylight, and their surface must not be touched with the fingers.

Spots and stains in prints can be removed and alterations made by special acids for both ferro-prussiate and ferri-cyanid papers the makers supply. But it is much best to avoid by extra care in drawing on the vellum the necessity.

Slight alterations can usually be made with pen and ink on the copies, and they can be colored with any tints that will show on the ground.

The estimate of materials required for the heliographic printing process and the memoranda of instructions for applying the process will be printed for the information and guidance of officers of the department.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

To Superintending Engineers.
„ the Consulting Architect to Government.
„ the Chief Engineer for Irrigation.
„ the Superintendent of Works, Periyár Project.

No. 4023 C., dated 29th November 1893.

Copy of the above forwarded to the Superintendent of Stationery in compliance with the request contained in that officer's letter No. 1454, dated 27th September 1893.

2. The price lists forwarded by the Superintending Engineer, III Circle, are also enclosed for information and favour of return.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

To the Superintendent of Stationery, with two enclosures returned.

Exd. C. A. Muniswamy.
Spare Copies

PUBLIC WORKS DEPARTMENT.

No. 4022 C., dated 29th November 1893.

MEMORANDUM.

Read—the following papers :—

From W. P. AUSTIN, Esq., C.S., Superintendent of Stationery, to the Chief Engineer, Public Works Department, dated Madras, 27th September 1893, No. 1454.

With reference to the Proceedings of Government in the Public Works Department, No. 854 D., dated 15th September 1893, referred to me for remarks by the Financial Department, I have the honour to request that you will be so good as to furnish me with an estimate of the probable quantities and cost of the paper and other material which may be required annually for the whole of the Public Works Department for the adoption of the ferro-prussiate and ferro-gallic process of copying plans recommended in the above.

No. 981 D.

Copy of the above forwarded to the Superintending Engineer, III Circle, with reference to the correspondence ending with his letter No. 1323, dated 18th August 1893, and with a request that he will be so good as to frame an estimate of the materials which, in his opinion, should be obtained for supply to the departments generally. The estimate should show the quantity to be issued to each office.

5th October 1893.

(Signed) J. HANNAN,
Ag. Chief Engineer, P.W.D.

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2. I also forward Messrs. Thacker and Co.'s price list and directions for reference and would request their return.

3. In order to make the information more complete, I have embodied their directions on a sheet of memoranda on heliographic copying, which to save time is sent in original and may be of course retained as the "detailed instructions" to which your paragraph 2 refers.

ENCLOSURES.

ESTIMATE of materials required for the heliographic printing process.

—	Tracing vellum, roll 33 yards × 40 inches.	Ferro-gallic paper, black lines on white, roll 20 yards × 40 inches.	Marion's ferro-prussiate paper, roll 20 yards × 40 inches.	Gallic acid.	Alum.	Sheet of plate glass, 20 inches × 26 inches.	Piece of felt, 21½ × 27½ inches.	Frame, 21½ inches × 27½ inches and ¾ inch thick.	Tin developing dish 34 inches × 24 inches × 2¼ inches.	Vulcanite trough, Imperial size, V shaped.
	For one Superintending Engineer.									
Amount ..	(a) 1½ rolls 49½ yards	(a) 2 rolls 40 yards	(a) 1 roll 20 yards	(a) 1 lb.	(a) 1 lb.	(b) 1	(b) 1	(b) 1	(b) 1	(b) 1
	For one Executive Engineer.									
Amount ..	2½ rolls 82½ yards	2 rolls 40 yards	4 rolls 80 yards	1 lb.	1 lb.	1	1	1	1	1

	Tracing vellum, roll 33 yards × 40 inches.	Ferro-gallic paper, black lines on white, roll 20 yards × 40 inches.	Marion's ferro-prussiate paper, roll 20 yards × 40 inches.	Gallic acid.	Alum.	Sheet of plate glass.	Piece of felt.	Frame, 21½ inches × 27½ inches and ¾ inch thick.	Tin developing dish, 34 inches × 24 inches × 2¼ inches.	Zinc or vulcanite trough, Imperial size, V shaped.
	For six Superintending Engineers.									
	(a) 9 rolls 297 yards	(a) 12 rolls 240 yards	(a) 6 rolls 120 yards	(a) 6 lb.	(a) 6 lb.	(b) 6	(b) 6	(b) 6	(b) 6	(b) 6
	For 34 Executive Engineers.									
	85 rolls 2,805 yards	68 rolls 1,360 yards	136 rolls 2,720 yards	34 lb.	34 lb.	34	34	34	34	34
Total ..	(a) 94 rolls 3,102 yards	(a) 80 rolls 1,600 yards	(a) 142 rolls 2,840 yards	(a) 40 lb.	(a) 40 lb.	(b) 40	(b) 40	(b) 40	(b) 40	(b) 40

(a) For one year. (b) For 10 years.

MEMORANDA on the Heliographic process of copying plans.

This process allows of any number of copies being made from an original drawing (or a tracing made from one) on translucent vellum, with much less expenditure of labour and time than the single copy on tracing cloth or paper taken from an ordinary plan.

There are three different kinds of heliographic paper in the market, viz., *ferro-prussiate paper* giving white lines on a blue ground, *ferri-cyanide paper* (blue lines on a white ground), and *ferro-gallic paper* giving black lines on a white ground.

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When a drawing (original or traced) has been prepared on vellum and examined for defects, all is ready for printing.

It is unnecessary here to describe the theory of the operation, because sensitive papers can be purchased ready for use and certain stock directions have only to be followed mechanically.

The easiest process of copying is by ferro-prussiate paper, Marion's ferro-prussiate paper being ready sensitized (white lines on a blue ground) and no chemical agents required, in rolls of 33 feet long and 39 inches wide. The printing apparatus consists of a sheet of thick plate glass 20 inches by 26 inches and ¾ inch thick, a piece of felt 21½ inches by 27 inches, and a flat wooden tray 21½ inches by 27½ inches and ¾ inch with a rim round two sides. This has been found sufficient in this country. But there are (see Fallowfield's Photographic Annual, 146 Charing Cross Road, W.) *box printing frames* procurable in which the progress of the print can be seen without disturbing its position. The size to take a sheet of imperial size 30 inches by 22 inches is priced £3-2-0 in London, but could be no doubt made up at less cost in the Madras workshops.

Using the wooden tray, all that is necessary is to lay the felt on the tray; place a piece of ferro-prussiate paper upon it, face upwards; upon that the sheet of vellum containing the drawing to be copied; and over all the sheet of plate glass. This should be done in a small room kept tolerably dark, or having yellow paper pasted over the window panes. The tray is then exposed to bright sunshine for ten minutes or more according to the sun's power. The exposure is sufficient when the colour of the ferro-prussiate paper is turned to an olive, to be ascertained by having a slight margin to the paper projecting beyond the drawing.

Then, in the darkened room, wash the print in clean water till the lines come out clear and hang the sheet up to dry.

In this manner any number of copies can be made in succession by an office muchi or peon. It is advisable to mount such as are of value, *e.g.*, contract and working drawings copied, on cheap calico.

Some authorities would prefer copies of plans in black lines on a white ground for reference, as white lines on a harsh blue ground are not very congenial to the eye, having to dwell upon them long. In this case resort can be had to *ferro-gallic paper* (in pieces of 20 yards length 40 inches wide, No. 13 medium paper, 19 per piece in London).

A drawing on vellum is prepared as before and laid over a sheet of ferro-gallic paper with the felt underneath and plate glass above.

The exposure takes from 5 to 10 minutes in the sun and from 15 to 60 minutes in diffused daylight.

The print has to be examined in the frame during exposure, and, when fully exposed, should appear white or very nearly white, the open margin of the print and the paper under the vellum showing little or no difference of tint. When that is the case, it has to be taken out and developed.

For developing a solution is made of 1 ounce of gallic acid and 1 ounce of alum to a gallon of water. The solution can be used for a day or two and for a succession of prints till it turns black.

In a large office the prints would be developed in zinc tray dishes some 34 inches by 24 inches and 2¼ inches deep.

But in small offices it would be more economical to use a tin or zinc trough of trapezoidal section, about 34 inches long and 5 inches deep, that width at top and 2¼ inches at bottom, and pass the paper through it backwards and forwards til developed.

After two or three minutes the print will appear in dark lines on a white ground, when it is removed and placed in a trough of clean water or laid on a slab of stone and water poured over it till a clean surface is obtained. The print must not be sponged.

Under-exposed prints will not show a white ground and the lines will be thick and woolly. Over-exposed prints will have fine and faint lines.

Any precipitate formed in making the developing solution must be decanted off and may be used in making up any fresh solution.

Ferri-cyanide paper (blue lines on a white ground) is more sensitive to light than the preceding and must be cut to size in a darkened room.

The exposure is made in the same way as before, but as it is of importance it should be correct. Test slips should be exposed at the same time as the print. From these slips a small piece is torn off when it is thought to have been long enough exposed. This is dipped into the developing solution. If it darkens rapidly the exposure is not sufficient; if, on the other hand, it shows but slight discoloration, the exposure must be stopped. The frame should be covered up or turned over during the test or it may be over-exposed. After some experience, the grey tone of the fully exposed print will be recognized and test slips become unnecessary.

The time of exposure according to the intensity of the light is—

In bright sunshine from 1 to 2 minutes.
Diffused daylight from 3 to 10 "
Dull weather from 10 to 30 minutes.

If the print is, after exposure, examined in a faint light, it will show a distinct but not a strong image of the tracing—yellow lines on grey ground—and by the appearances the right exposure can be easily judged when experience has been gained.

To compose the developing solution, ½ lb. of red and ½ lb. of yellow prussiate of potash (commercial samples) are dissolved in one gallon of hot water and let cool. The solution will keep indefinitely and may be used until exhausted. As soon as the lines are out clearly development should be stopped and the print flooded with cold water and then washed as in the directions for development.

To develop, the edges of the print should be turned up ½ an inch all round before removal from under the glass to prevent any of the developing solution getting on the back of the paper.

The print is then floated on the solution in a large zinc tray, say, 34 inches by 24 inches by 2¾ inches deep, and to ensure its getting to all parts of the surface the print is raised from time to time to examine its stage of development, which will take from one to two minutes. The drawing will soon appear in distinct bluish-green lines on a ground of yellowish green, after which the print is taken up carefully and washed in cold water or laid on a slab and water poured over it; thereupon a flat copying brush (or a sponge) is passed very gently over it till every trace of blue has vanished from the surface and dark blue lines stand clearly out upon a blue ground. After leaving the print to soak in the water for a few minutes, which may be once or twice renewed, it is hung up to dry.

It will be evident from the foregoing directions that Executive Engineers will find the use of ferro-prussiate paper most convenient for ordinary plans, and especially working drawings.

For plans to accompany important estimates requiring Government sanction, ferro-gallic copies prepared after the drawings on vellum had received final corrections might be used.

The advantage of ferri-cyanid paper would seem to be that, while giving dark blue lines on a white ground, it is rather more sensitive and requires shorter exposure than ferro-gallic paper.

It is obvious that all these heliographic papers must be carefully kept in tin cases out of influence of both damp and daylight, and their surface must not be touched with the fingers.

Spots and stains in prints can be removed and alterations made by special acids for both ferro-prussiate and ferri-cyanid papers the makers supply. But it is much best to avoid by extra care in drawing on the vellum the necessity.

Slight alterations can usually be made with pen and ink on the copies, and they can be colored with any tints that will show on the ground.

The estimate of materials required for the heliographic printing process and the memoranda of instructions for applying the process will be printed for the information and guidance of officers of the department.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

To Superintending Engineers.
" the Consulting Architect to Government.
" the Chief Engineer for Irrigation.
" the Superintendent of Works, Periyár Project.

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No. 4023 C., dated 29th November 1893.

Copy of the above forwarded to the Superintendent of Stationery in compliance with the request contained in that officer's letter No. 1454, dated 27th September 1893.

2. The price lists forwarded by the Superintending Engineer, III Circle, are also enclosed for information and favour of return.

(Signed) J. PENNYCUICK, Colonel, R.E.,
Chief Engineer, P.W.D.

To the Superintendent of Stationery, with two enclosures returned.

Exd. C. A. Muniswamy.
Spare Copies

S.E.'s No. 1753 d/11th Oct.

D.W.

9

The Estimate submitted by Colonel Fraser is by no means clear, and to draw up a complete one without an acquaintance with the heliographic printing process is not easy.

In the accompanying Statement I have shown what seem to be the articles required. Before it is sent on to the Supdt. of Stationery, it should, perhaps, be checked by Colonel Fraser, who might be asked at the same time to forward any printed instructions he may have, or in their absence to draw up instructions, for the guidance of officers, who will otherwise not know how to use the materials when

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P.W. Department.

-11-1893

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STATIONERY OFFICE,
Madras, 2nd November 1893.
3-11-93

W. P. Austin Esqr. B.S.
SUPERINTENDENT OF
STATIONERY,

the Chief Engineer
Public Works Deptt:
Madras

REMINDER.

he honour to invite his attention to
No. 1454 dated 27th
er 1893, and to request an early
o.

Superintendent.

d/ 5-10-93

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they get thee.

A.S.
18 Oct

Chr. 8785

D.W.

Colonel Fraser will probably prefer the best estimate. He might be asked to draw one up for the whole Dept?

A.S.
2 Oct.

Yes. I think so

O.V.S.
2.10.93

H
2/10

P.W. Department.

-11-1893

137

STATIONERY OFFICE,
Madras, 2nd November 1893.
3-11-93

W. P. Austin Esq. B.S.
SUPERINTENDENT OF
STATIONERY,

THE Chief Engineer
Public Works Deptt:
Madras.

REMINDER.

the honour to invite his attention to
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4022C - 29-11-9

P.W. Department.

No 3668 C of 6-11-1893

To

7

No. 1637

STATIONERY OFFICE,

Madras, 2nd November 1893.

3-11-93

From

W. P. Austin Esq. C.S.

SUPERINTENDENT OF

STATIONERY,

To

THE Chief Engineer

Public Works Deptt:

Madras

Subject.

Requesting to be furnished with an estimate of the probable quantities and cost of the paper for the Ferro-prussiate and Ferro-gallic process.

REMINDER.

HAS the honour to invite his attention to this Office, No. 1464* dated 27th September 1893, and to request an early reply thereto.

[illegible]

Superintendent.

*981 D of 5-10-93

P. W. CURRENT No. 9376

Recd 6·11·93

P. W. Department.

No 3668 C.W./ 6—11—1893

To

The Superintendent
of Stationery

Sir,

In reply to your reminder No 1637 dated 2 November 1893, I have the honor to inform you that the estimate of materials for the helio-graphic printing process therein referred to is under preparation, and that it will be forwarded as soon as it is ready.

I have &c

EW

6.11

DESPATCHED
7 NOV. 93

Estimate of materials required for the Heliographic printing process.

	For one Supdg Engineer.										For six Supdg Engineers.										
	Tracing Vellum Roll 33 yds × 40 inches	Ferro gallic paper Black lines on white Roll 20 yds × 40 inches	Marion's Ferro Prussiate paper Roll 20 yds × 40 inches	Gallic acid.	Alum	Sheet of plate glass	Piece of felt	Frame 21½" × 27½" × ¾" thick	Tin developing dish	Vulcanite trough imperial size & shaped	Tracing Vellum Roll 33 yds × 40 inches	Ferro gallic paper Black lines on white Roll 20 yds × 40 inches	Marion's Ferro Prussiate paper Roll 20 yds × 40 inches	Gallic acid	Alum	Sheet of plate glass	Piece of felt	Frame 21½" × 27½" and ¾" thick	Tin developing dish.	Vulcanite trough imperial size & shaped	
Amount.	(a) 1½ rolls 49½ yds	(a) 2 rolls 40 yds	(a) 1 roll 20 yds	(a) 1 lbs	(a) 1 lb	(b) 1	(b) 1	(b) 1	(b) 1	(b) 1	(a) 9 rolls 297 yds	(a) 12 Rolls 240 yds	(a) 6 rolls 120 yds	(a) 6 lbs	(a) 6 lbs	(b) 6	(b) 6	(b) 6	(b) 6	(b) 6	(a) For one ye (b) For 10 y
											For [illegible] Engineers.										
Amount	2½ rolls 82½ yds	2 rolls 40 yds	4 rolls 80 yds	1 lb	1 lb	1	1	1	1	1	85 Rolls 2805 yds	68 Rolls 1360 yds	136 Rolls 2720 yds	34 lbs	34 lbs	34	34	34	34	34	
Total											(a) 94 Rolls 3102 yds	(a) 80 Rolls 1600 yds	(a) 142 Rolls 2840 yds	(a) 40 lbs	(a) 40 lbs	(b) 40	(b) 40	(b) 40	(b) 40	(b) 40	(a) For one year (b) For 10 years.

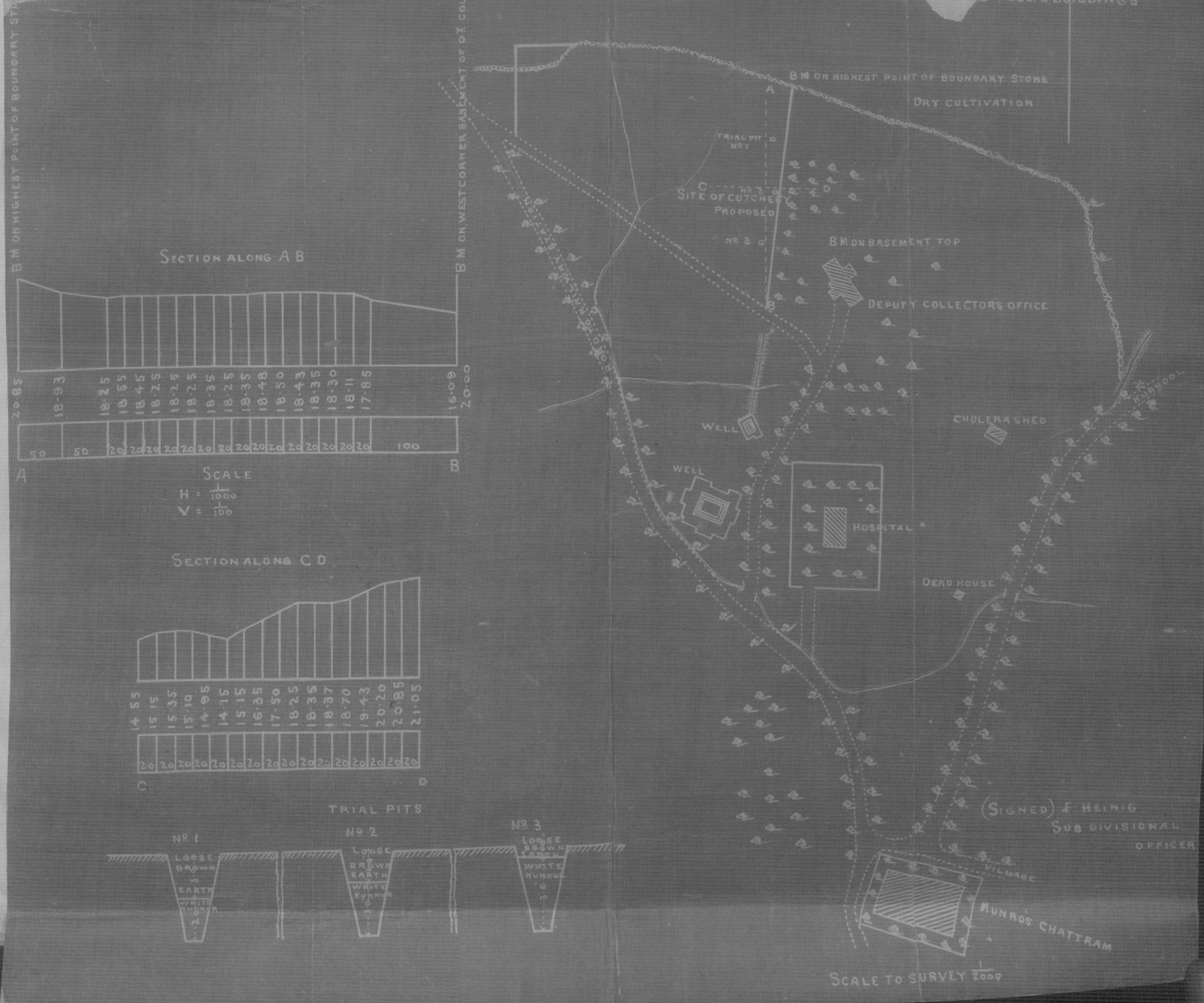
No. 3668 cd/ 6th Novr.
1893

No. 3569 cd/ 2-11-93
3484 cd/ 27-10-93
3481 cd/ 27-10-93
981 D d/ 5-10-93
854 D d/ 15-9-93
2931 cd/ 24-8-93

TION OF GOOT

OSED NEW TALUK CUTCHER

E PUBLIC BUILDINGS



(SIGNED) F HEINIG
SUB DIVISIONAL
OFFICER

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Estim

Heliographic

for a Superin

(1)	1/2 Rolls - Traci	[illegible]
(2)	2 Rolls - Ferro-Gallic paper. Black lines on white 20 yds: 40 inches wide Rs 18	36
(3)	1 Roll - Marion's Ferro Prussiate paper - white lines on blue ground 20 yds - 40 inches Rs 22	22
(4)	1 lb Gallic Acid ~~Rs~~ say Rs 5/2	5/
(5)	1 lb Alum Do - 1/2	1/
	Total Rs	97

For an Executive Engineer's Office

2 1/2 Rolls Tracing Vellum at 22	55
2 Rolls Ferro-Gallic paper - 18	36
4 Rolls - Marion's Ferro-Prussiate paper	88
1 lb Gallic Acid	5/
1 lb Alum	1/
Total Rs	185

Note. One office may use more and other less according to nature of work.

Besides the above Each office requires a

+ felt? (6) Sheet of plate glass, piece of ~~belt~~ + and
(7)
(8) frame (Size 21 1/2" by 27 1/2" and 3/4" thick)

to start with

for the Gallic (9

- and which

ry

ote. — Messrs Marion and Co London
should be asked to supply a special
vulcanite trough for developing sheets (10)
up to imperial size, V shaped, so as not to
occupy space as would a pan trough
of that size. The paper can be merely
drawn through till developed —

AT Fraser Col R.E
Supdg Engineer
III Circle

Bellary }
th Oct/93 }

OW 8/1
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11 8

No. 1753

Superintending Engineer's Office,
3RD CIRCLE.
Bellary 11th October 1893,

FROM
Colonel A T Fraser R.E.
SUPERINTENDING ENGINEER.
IIIRD CIRCLE.

8
563/3

To
THE Chief Engineer
P.W.D.
Ootacamund

Sir,

Enclosures. 1

I have the honor in reply to your No. 9512 dated 5th October/93 to forward an Estimate of the Heliographic printing Stores required annually in a Superintending Engineer's and an Executive Engineer's office respectively.

2. It is not at all desirable that the Stationery office should lay in a large stock of Tracing and sensitized papers.

3. The vellum tends to get yellow and deteriora if long kept, and the Ferro-Gallic and Ferro Prussiate papers must also suffer in a warm climate and from damp.

4. I would suggest that the Superintendent of Stationery Contract with one of the large firms — such as Messrs Thacker and Co: of Bombay — who constantly import a fresh stock and ha extensive dealings with the Railway Companie and private drawing offices of Engineers, and that passed indents should be complied wit

direct

direct by the contracting firm.
5. The indents should be only for minimum quantities at a time, and it is economical they should be repeated as often as necessary.
6. The Ferro-Prussiate paper is easiest managed and would most likely be preferred by Executive Engineers for their working drawings.
7. But the black lines on a white ground of Ferro-Gallic paper, are best suited to plans which have to be submitted with Estimates to Govt.
8. The extra cost is trifling and the manipulation, when once practised, not difficult.
9. So that supplies of both are requisite.
10. In Superintending Engineers' Offices a preference would probably be given to Ferro-Gallic paper, and blue paper little used.
11. I would mention when on the subject, that the success of Heliographic printing largely depends on the precautions taken by the Draughtsman in making the tracing on Vellum.
12. The lines have to be bold, and done with ink of a uniform blackness: that is, to show opaque when held up to the light.
13. Buildings have also to be shaded all over, or hatched, else they will not stand out distinct on a Survey, and some attention has to be given to line contrasts.

14. It is very desirable that Draughtsmen should go through a brief & Course of Helio-graphic tracing and printing at the Engineeri College during their training. The whole migh be well learned in a couple of weeks.
15. Besides the above precautions, more care has to be taken than usually is, when makin ordinary tracings, that the component part of plans are laid down compactly, so a to avoid waste of both Vellum and Heliograph paper, in wide marginal spaces.
16. It may be noted that by using tracing Vellum for original drawings, there would a corresponding saving in drawing paper and this is often practicable.

I have the honor to be
Sir
Your most Obdt. Serv
A. Fraser Col.
Superintending Engineer
III Circle.

P. W. CURRENT No. 8963

From, Col. A. Fraser R.E.
~~The~~ Superintending Engineer,
IIIrd Circle,
Bellary.

To,
The Chief Engineer
P.W.D.
Ootacamund

Dated 11th } October 1893.
Received 23 }

Enclosures. 1

No. 1753

Subject.

Heliographic [illegible] Stores

Forwarding estimate for -

78 D d/ 5-10-93
854 D d/ 15-9-93
2931 C d/ 24-8-93

Recd 13/10

[illegible] 21/10
[illegible] 20-10

G.O. No. 563-W. 8th M[illegible] 94

[G./53]
5,000—13-2-94.

Read the following papers

G.O. dated 22 Feby 1894 No 153 Financial

39

14

Financial Department.

CHIEF SECRETARIAT,
MADRAS.

13

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following papers:—

Memorandum of the Public Works Depa
ment, dated 15th September 1893, No 854 D.

Endorsement of the Public Works Department,
dated 10th February 1894 No 611 G, on letter from the Superintend
Engineer Second Circle, dated 1st February 1894, No 2587 KS.

From the Superintendent of Stationery, Madra
dated 14th February 1894, No 188.

With reference to your Endorsement No 1656, dat
23rd September 1893, forwarding for my remarks the Memorandum
from the Public Works Department No 854 D. dated 15th September 18
(herewith returned) requesting that paper for Ferro gallic process m
be included in Appendix A to the Stationery Rules, as an artic
of supply to the Public Works Department, I have the honor to
report as follows:-

2. The Superintending Engineer III Circle states that th
use of Heliographic paper for copying plans has been found
both economical and practical for every purpose. The materials requ
for the process for all the circles and the Sub Divisions of the
Public Works Department are given in the margin a
their

their value is estimated at Rs 8012-9-2. It appears that the first five articles valued at Rs 6766-13-„ will be required annually and the remainder valued at Rs 1245-12-2 once in 10 years only.

	Rs	a	p
Tracing Vellum in rolls of 33 × 40 at Rupees 22 per Roll for 94 Rolls	Rs 2068	„	„
Ferro gallic paper, Black lines on white Roll of 20 yds × 40 at Rs 18/ per Roll for 80 Rolls	„ 1440	„	„
Marions Ferro prussiate paper Roll of 20 yds × 40" at Rs 22/ per Roll for 142 Rolls	„ 3124	„	„
Gallic acid at 4sh per lb for 40 lb = 160sh	130	2	8
Alum at 1sh for 7 lb for 40 lb 40/7 s	„ 4	10	4.
Total Rupees	6766	13	„
Materials required once in 10 years.			
Sheet of plate glass, 1 Felt and 1 Frame 21½" × 27½" × 3/4" at Rs 15 for the lot for 40	Rs 600	„	„
Tin Developing dish 34" × 24" × 2 3/4" at Rupees 1-8-„ each for 40	„ 60	„	„
Zinc or Vulcanite trough Imperial Size & Shaped 18sh each for 40 - 720sh or £36	„ 585	12	2.
	Rupees 1245	12	2
Total cost for the 1st year	„ 8012	9	2
For the succeeding 9 years the cost will be only	„ 6766	13	„

3. If the Government is pleased to sanction the introduction of this new process of copying plans &c I would suggest that the officers of the Public Works Department be required after a trial of a year or two to report on the practicability and advantage of the new process and the savings resulting therefrom.

4. The articles will be included in the next indent on the Secretary of State, which is due to Government on the 1st March next and will be supplied to officers as soon as they are received from England.

5. As I have had to obtain some more particulars from the Public Works Department regarding estimates of quantities and value of the required materials there has been some delay in submitting my reply to the above reference from Government.

Order, 22nd February 1894, No 153.

The proposal to include in appendix A to the Stationery rules all materials necessary for the ferro prussiate and the ferro-gallic processes of copying plans, as articles of supply to the Public Works Department, is approved.

2. The attention of the Superintendent of Stationery will be drawn to the alteration as regards the size of glass proposed in the letter from the Executive Engineer Kistna, Western Division, dated 24th January 1893, No 626.

3. Arrangements will be made in the Public Works department for the report referred to in paragraph 3 of the Honorable Mr Austin's letter of the 14th February.

4. The Superintendent of Stationery will note the necessary corrections to be made in the Stationery rules.

(True Extract)

Lionel Davidson
23-2
Ag. Assistant Secretary

To
The Public Works Department (with C No 377 and two plans)
Superintendent of Stationery

P. W. Dept:

No: 611 C d/10 Febry: '94

Endorsement

From the S. E. II. Circle No. 2587 K.S d/ 1st Febry:/94

No: 821.
Enquiring if a set of materials required for the heliographic printing press can be indented for.

Referred to the Financial Dept: in continuation of endorsement No. 854 D. d/ 15 September /93. A complete estimate of the requirements of the P. W. D has since been drawn up at the request of the Supt: of Stationery - a copy is attached for information.

To
The Finl. Dept:
with a copy of No.
4023. C d/ 29-11-93.

No. 4022-3C d/ 29-11-93
854D d/ 15-9-93
3013W d/ 21-11-93
3569C d/ 2-11-93
3484C d/ 27-10-93
190C d/ 18-1-94
3668C d/ 6-11-93
3481C d/ 27-10-93

No. 611 C d/ 10 Febry. '94

P. W. CURRENT No. 824
5.1

[illegible] Current [illegible] 377

1469/94

From

The Supdg. Engineer
Second Circle

To

The Chief Engineer
P. W. Department

Dated 1st February 1894.
Recd. 3.2.94

No. 2527 KS

Heliographic printing press — Enquiring if a set of materials required for the — can be indented for —

No. 611C d/10 Febry: '94

Referred to the Financial Dept in continuation of Endorsement No. 854 D dated 15th September 1893. A complete estimate of the requirements of the P. W. D. has since been drawn up at the request of the Superintendent of Stationery. A copy is attached for information.

J. McCarry
Capt. R.E.
Secretary to Govt P.W.D

To
The Financial Dept
with a copy of No. 4023C
d/ 29-11-93.

No. 854 D d/ 15-9-'93 P. W. Department

22 12

Memorandum.

From the S. E. III circle No. 1295 d/ 15 August 1893.
Memo to the S. E. III circle No. 2931 C d/ 24 August 1893
From the — do — No. 1323 d/ 18 August 1893
Do — do — do — No. 1423 d/ 29 August 1893.

Copies forwarded to the Financial deptt.

2. Paper for the Ferro prussiate process of copying plans is already included in appendix A to the Stationery Rules as an authorised article of supply to the P. W. Deptt. It is requested that paper for the Ferro-galli process may also be included, together with the outfit necessary in each case. Officers of the P. W. D will then be enabled to employ either process at discretion.

OW
14.9.93

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JH
14.9

To
The Financial deptt
with 2 plans.

Despd 15/9 Cu

No. 854 D dy 15-9-9

P-1

16

STATIONERY OFFICE,

Madras, 27th September 1893.

No. 1454

From

W. P. Austin Esquire C.S.

SUPERINTENDENT OF STATIONERY,

To

The Chief Engineer.

Public Works Department

With reference to the Proceedings of Govt in the P.W.D. No 854 D. dated 15th September 1893 referred to me for remarks by the Financial Department, I have the honor to request that you will be so good as to furnish me with an estimate of the probable quantities and cost of the paper and other material which may be required annually for the whole of the Public Works Department for the adoption of the Ferro Prussiate and Ferro gallic process of copying plans recommended in the above.

I have the honor to be
Sir
Your most obedient Servant

Assistant
For Superintendent

RM

P. W. CURRENT No. 8285

No 824 O G 15-7-90
" 2529 C dy 6-7-93
2931 C dy 24-8-93
~~Sc 981 D dy 5-10-93~~

Recd: 28.9.93

P. 1-A

Copy of the above forwarded to the Supdg: Engineer III Circle with reference to the correspondence ending with his letter No 1323 dt 18 Aug 1893, and with a request that he will be so good as to frame an estimate of the materials which in his opinion should be obtained for supply to the Department generally. The estimate should show the quantity to be issued to each offi

3/10

EW

S.E. III Circle

C.E.

~~I have the honour to be,~~

~~Sir,~~

~~Your most obedient Servant~~

3/10

No 3370

~~Superintendent~~

P-2

No. 2041

Superintending Engineer's Office,
3RD CIRCLE.
Bellary 11th November 1893,

FROM
Colonel A. T. Fraser R.E.
SUPERINTENDING ENGINEER,
IIIRD CIRCLE.

TO
THE Chief Engineer,
P. W. D.
Madras.

Enclosures. 4

× Sent to CAW with Lr. 9509 dt 10-11-93

Sir,

In reply to your No. 3481 C dated 27th October 1893, I have the honor to return the enclosed estimate of materials which seems correct.

2. I also forward Messrs. Thacker & Co's price list and directions for reference and would request their return.

3. In order to make the information more complete, I have embodied their directions on a sheet of memoranda on Heliographic copying which to save time is sent in original and may be of course retained as the "detailed instructions" to which your para 2 refers.

I have the honor to be
Sir
Your most obedient servant
A. T. Fraser Col. R.E.
Supdg. Engineer, III Circle.

P. W. CURRENT No. 9617

From, Col. A. Fraser R.E.
~~The~~ Superintending Engineer,
IIIrd Circle,
Bellary.

To,
The Chief Engineer
P.W.D.
Madras

Dated 11th } November 1893.
Received }

Enclosures. 4

No. 2041

Subject.

Heliographic copying

Returning estimate &c a/f

No. 3668 C d/ 6-11-93
981 D d/ 5-10-93
3481 C d/ 27-10-93
3013 W d/ 21-11-93
3567 C d/ 2-11-93
854 D d/ 15-9-93
2931 C d/ 24-8-93

Memoranda on the Heliographic process of Copying plans.

This process allows of any number of copies (or a tracing made from one) being made from an original drawing on translucent vellum, with much less expenditure of labor & time than the single copy on tracing cloth or paper taken from an ordinary plan.

There are three different kinds of heliographic paper in the market; viz: Ferro-Prussiate paper giving white lines on a blue ground; Ferri-Cyanide paper (blue lines on a white ground) & Ferro-Gallic paper giving black lines on a white ground.

But the use of any one of these kinds requires the preparation first of a drawing in black lines on translucent vellum. This requires care if every line in the copy is to show up distinct. The vellum may be used like drawing paper for original plans; being easily drawn upon; or it may be made use of as tracing paper. The indian ink must be rubbed up thick, & the lines be drawn with as much boldness as the nature of the design will allow. When finished, the vellum must be held up to the light, & any translucency in lines blackened out; else the print will be feeble at those places. To prevent flies settling & eating off the ink, sheets when finished should be put in a tin box, or a portfolio. As colors cannot be printed, contrast of lines has to be relied upon to give plans relief & effect; especially survey maps; & this wants some training of draftsmen accustomed to make thin lines of uniform thickness, & trust to color for their better explanation. Much variety can however be obtained by shading in indian ink all depths up to dense black; & by hatching; dotting; & the like devices.

When a drawing (original or traced) has been prepared on vellum; & examined for defects; all is ready for printing.

It is unnecessary here to describe the theory of the operation; because sensitive papers can be purchased ready for use, & certain stock directions have only to be followed mechanically.

The easiest process of copying, is by Ferro-Prussiate paper — Marion's Ferro-Prussiate paper being ready sensitized (white lines on a blue ground), & no chemical agents required. In rolls of 33 ft. long & 39 inches wide — The printing apparatus consists of a sheet of thick plate glass 20 in by 26 in & 3/8 in thick a piece of felt 21½ in by 27 in & a flat wooden tray 21½ in by 27½ & 3/4 with a rim round two sides. This has been found sufficient in this country. But there are (see Fallowfield's Photographic Annual 146 Charing Cross Road W) Box printing frames procurable in which the progress of the print can be seen without disturbing its position. The size to take a sheet of Imperial being 30 in by 22 in is priced £3.2.0 in London but could be no doubt made up at less cost in the Madras workshops.

Using the wooden tray, all that is necessary is to lay the felt on the tray; place a piece of Ferro-Prussiate paper upon it, face upwards; upon that the sheet of vellum containing the drawing to be copied; & over all the sheet of plate glass. This should be done in a small room kept tolerably dark, or having yellow paper pasted on the window panes. The tray is then exposed to bright sunshine for ten minutes or more, according to the sun's power. The exposure is sufficient when the color of the Ferro-Prussiate paper is turned to an olive; to be ascertained by having a slight margin to the paper projecting beyond the drawing.

Then, in the darkened room, wash the print in clean water till the lines come out clear, & hang the sheet up to dry.

In this manner any number of copies can be made in succession by an office menial or peon. It is advisable to mount such as are of value; e.g., contract & working drawings copied; on cheap calico.

Some authorities would prefer copies of plans in black lines on a white ground in preference, as white lines on a harsh blue ground are not very congenial to the eye having to dwell upon them long. In this case, resort can be had to Ferro Gallic paper (in pieces of 20 yds length 40 inches wide No. 13 medium paper. 19/- per piece in London).

A drawing on vellum is prepared as before, & laid over a sheet of Ferro-Gallic paper, with the felt underneath, & plate glass above.

The exposure takes from 5 to 10 minutes in the sun; & from 15 to 60 minutes in diffused daylight.

The print has to be examined in the frame during exposure; & when fully exposed, should appear white, or very nearly white; the open margin of the print, & the paper under the vellum, showing little or no difference of tint. When that is the case, it has to be taken out, & developed.

For developing a solution is made of 1 ounce of Gallic Acid, & 1 ounce of Alum, to a gallon of water. The solution can be used for a day or two, for a succession of prints, till it ~~they~~ turns black.

In a large office, the prints would be developed in zinc tray dishes some 34 in by 24 in & 2¾ inches deep.

But in small offices, it would be more

Economical to use in some time a trough of trapezoidal section, about 34 inches long & 5 inches deep, that width at top & 2¾ inches at bottom, & pass the paper through it backwards & forwards till developed.

After two or three minutes the print will appear in dark lines on a white ground; when it is removed, & placed in a trough of clean water; or laid on a slab of stone & water poured over it; till a clean surface is obtained. The print must not be sponged.

Under-exposed prints will not show a white ground; & the lines will be thick & woolly — Over-exposed prints will have fine & faint lines.

Any precipitate formed in making the developing solution must be decanted off & may be used in making up any fresh solution.

Ferrocyanide paper. (Blue lines on a white ground) is more sensitive to light than the preceding, & must be cut to size in a darkened room.

The exposure is made in the same way as before, but as it is of importance it should be correct. Test slips should be exposed at the same time as the print. From these slips, a small piece is torn off when it is thought to have been long enough exposed. This is dipped into the developing solution. If it darkens rapidly the exposure is not sufficient; if on the other hand it shows but slight discoloration, the exposure must be stopped. The frame should be covered up, or turned over, during the test, or it may be overexposed. After some experience, the grey tone of the fully exposed print will be recognized, & test slips become unnecessary.

The time of exposure according to the intensity of the light is,

In bright sunshine from 1 to 2 minutes
Diffused daylight do 3 to 10 do
dull weather do 10 to 30 do

If the print is, after exposure, examined in a faint light, it will show a distinct but not a strong image of the tracing; yellow lines, on grey ground; & by the appearances, the right exposure can be easily judged when experience has been gained.

To compose the developing solution, ½ lb of Red, & ½ lb of Yellow Prussiate of Potash (commercial samples) are dissolved in 1 gallon of hot water, & let cool. The solution will keep indefinitely, & may be used until exhausted. As soon as the lines are out clearly development should be stopped; & the print flooded with cold water; & then washed, as in the directions for development.

To develop; the edges of the print should be turned up ½ an inch all round before removal from under the glass to prevent any of the developing solution getting on the back of the paper.

The print is then floated on the solution in a large zinc tray say 34 in by 24 in by 2¾ inches deep, & to ensure it getting to all parts of the surface the print is raised from time to time to examine its stage of development, which will take from one to two minutes. The drawing will soon appear in distinct bluish-green lines on a ground of yellowish green, after which

The print is taken up carefully, & washed in cold water, or laid on a slab & water poured over it, thereupon a flat copying brush (or a sponge) is passed very gently over it till every trace of blue has vanished from the surface & dark blue lines stand clearly out upon a blue ground. After leaving the print to soak in the water for a few minutes, which may be once or twice renewed it is hung up to dry.

It will be evident from the foregoing directions, that Executive Engineers will find the use of Ferro-prussiate paper most convenient for ordinary plans & especially working drawings.

For plans to accompany important Estimates requiring Govt. sanction, Ferro-Gallic copies prepared after the drawing on vellum had received final corrections might be used.

The advantage of Ferricyanide paper would seem to be, that, while giving dark blue lines on a white ground it is rather more sensitive, & requires shorter exposure than Ferro Gallic paper.

It is obvious that all these heliographic papers must be carefully kept in tin cases out of influence of both damp & daylight; & their surface must not be touched with the fingers.

Spots & stains in prints can be removed, & alterations made by special acids for both Ferroprussiate & Ferricyanide papers, the makers supply. But it is much best to avoid, by extra care in drawing on the vellum, ~~for~~ the necessity.

Slight alterations can usually be made with pen & ink on the copies, & they can be colored with any tints that will show on the ground.

Nov. 10. 1893

Accompaniment to 3rd Circle

No. 2041 of 11th November/93

Pro 51
567/93

24

0-8

P. W. D.

No 4022 C d/ 29 — 11 — 1893

24

Memorandum

Letter from the Supdt of Stationery - No 1452 d/27 Sep 1893
Letter from the Supdg. Engr III circle A.2 No 2041 d/11 Nov 1893

The estimate of materials required for the Heliographic printing process and the Memoranda of instructions for applying the process will be printed for the information and guidance of officers of the department.

Supdg. Engineers
C. A. to Govt
Ch. Engr for Irrign
S. of W. P. Project

DESPATCHED
15 DEC. 93

No 4023 C d/ 29 — 11 — 93
E. W.

Copy of the above forwarded to the Superintendent of Stationery in compliance with the request contained in that officer's letter No. 1454 dated 27 September 1893.

The price lists forwarded by

by the Suptg. Engineer III circle are also enclosed for information and favour of return.

E. W.

17.11.93

30/11/93

Circular

No 4822 C of 29th Nov
4023

DESPATCHED
15 DEC. 93

To.
The Supt. of Stationery
with the 2 enclosures
to be returned

[G./16] P. W. CURRENT No. 1469

Govt. of {18 } Madras.

To

The Public Works Dept.

Enclo 4 (2 plans)
Recd: 26.2.94

Proceedings, dated 22nd February 1894.
No. 153

Subject.

Approving of the proposal to include in Appendix A to the Stationery Rules all materials necessary for the ferro-prusside and ferro-gallic processes of copying plans, directing the P.W. Dept to arrange for a report on the advantage for a report on the advantage of the new process after a trial of a year or two and drawing the attention of the Superintendent of Stationery to certain altera-tion proposed in the size of glass.

6

Public Works Dept.

No. 3481 C d/ 27-10-1893

363/7

363/7

Memorandum

Letter from the S. E. III Circle No. 1753 d/ 11 Octr. '93

With reference to the letter quoted above, the Supdg. Engineer III Cir is requested to be so good as to examine the accompanying estimate of materials required for the heliographic printing process and to state whether it is correct.

2. It also seems necessary that officers should be furnished with detailed instructions for using the materials when received. If therefore there are any printed instructions extant, i

is required that
copy may be furnished,
f not, that Colonel
raser will be so good
s to draw up a set
f instructions.

JH
24/10

EW

No 3481 C d/27th October
1892

DESPATCHED

To
The S.E. III Circle

(Keep a copy of the estimate
for office record)

9

No. 1423 — Superintending Engineer's Office,
3rd Circle,
Bellary 29th Augt 1892,

From Colonel A. T. Fraser R.E.
SUPERINTENDING ENGINEER.
IIIrd CIRCLE.

To
THE Chief Engineer
P.W.D.
Madras

Sir,

Enclosures.
[illegible]
Subject
[illegible]

I have the honor to state in reply to Chief Engineer's No: 2731 C dated 24th August/92 that the outfit for Heliographic Copying of Plans is,

A sheet of plate glass 20" by 26"

A piece of felt 21½" by 27".

A drawing board 21½" by 27½ and ¾" thick with a ledge on two sides to keep the plate glass from sliding.

A roll of tracing Vellum 40" wide, and 33 yds long.

A roll of Marion's Ferro prussiate paper, ready-sensitized, white lines on blue ground, 39" wide and 33 ft: long.

2. To give black lines on a white ground the outfit is.

Plate glass, felt, and drawing board ledged as before described.

A roll of tracing Vellum.

A roll of Ferro-Gallic prepared paper, made in Germany, 40" wide and 20 yds long

4 ounces Gallic Acid

4 ounces Alum

A tin trough for developing in, say 30" long, 4" wide at top, 2" wide at bottom, and 4" deep with side supports.

I have the honor to be
Sir
Your most obdt Servt
A T Fraser Col R.E
Superintending Engineer
III Circle

No. 1323

Superintending Engineer's Office,
3RD CIRCLE.
Bellary 18th August 1893,

FROM
Colonel A. T. Fraser R.E.
SUPERINTENDING ENGINEER.
IIIRD CIRCLE.

To
THE Chief Engineer,
P. W. D.
Madras.

Enclosures.
"Specimen print by book post"

Sir,

In continued reference to the subject of Heliographic copying — this Office No. 1295 of August 1 current, I have the honor to enclose the site plan of the Anantapur Collector's Residence done in black lines by the Ferro Gallic process.

2. The Ferro-gallic paper is obtained in rolls of 20 yards by 40 inches for Rs 18 per roll.

3. With 10 minutes exposure in sunshine it is developed in a bath of 1 Oz Gallic acid and 1 Oz common Alum to a gallon of water and then washed in plain water.

4. The black lines on a white ground are more pleasing than the crude blue of Ferro Prussiate paper and trouble and cost are not very different.

I have the honor to be
Sir
Your most obedient servant
A T Fraser Col R.E.
Supdg. Engineer, III Circle

Estimate of materials required for the Heliographic printing process

	For one Supdg. Engineer.										For Six Supdg. Engineers										
	Tracing Vellum Roll 33 yds × 40 in.	Ferro Gallic paper black lines on white. Roll 20 yds × 40 inches	Marions' Ferro Prussiate paper Roll 20 yds × 40 inches	Gallic acid	alum	Sheet of plate glass 20 in by 26 in	Piece of felt 21½ by 27½ in	Frame 21½" × 27½" & ¾" thick	Tin developing dish 34 in × 24 [illegible]	Vulcanite trough imperial size – V shaped	Tracing Vellum Roll 33 yds × 40 inches	Ferro Gallic paper Black lines on white. Roll 20 yds × 40 inches	Marions Ferro Prussiate paper Roll 20 yds 40 inches.	Gallic Acid	Alum	Sheet of plate glass	Piece of felt	Frame 21½" × 27½ and ¾" thick	Tin developing dish 31½" × 24½"	Vulcanite trough imperial size – V shaped.	
Amount.	(a) 1½ Rolls 49½ yds.	(a) 2 Rolls 40 yds.	(a) 1 Roll 20 yds.	(a) 1 lb	(a) 1 lb	(b) 1	(b) 1	(b) 1	(b) 1	(b) 1	(a) 9 Rolls 297 yds.	(a) 12 Rolls 240 yds.	(a) 6 Rolls 120 yds.	(a) 6 lbs	(a) 6 lbs	(b) 6	(b) 6	(b) 6	(b) 6	(b) 6	(a) For one year (b) For 10 years.
	For one Executive Engineer.										For 34. Executive Engineers										
Amount.	2½ Rolls 82½ yds.	2 Rolls 40 yds.	4 Rolls 80 yds.	1 lb	1 lb	1	1	1	1	1	85 Rolls 2805 yds.	68 Rolls 1360 yds.	136 Rolls 2720 yds.	34 lbs	34 lbs	34	34	34	34	34	
										Total {	(a) 94 Rolls 3102 yds.	(a) 80 Rolls 1600 yds.	(a) 142 Rolls 2840 yds.	(a) 40 lbs	(a) 40 lbs	(b) 40	(b) 40	(b) 40	(b) 40	(b) 40.	(a) For one year (b) For 10 years.

28 Divisions
6 Tank [illegible]
34

R S
18 Oct

P. W. CURRENT No. 7248

From, Col. A. J. Fraser R.E.
~~The~~ Superintending Engineer,
IIIrd Circle,
Bellary.

To,
The Chief Engineer
P.W.D.
Madras

Dated 18th August 1893.
Received 21st

Enclosures. 1 Plan by bookpost
No. 13231

Subject.

Forwarding

No. 2931 C d/24-8-93

Transferred to the [illegible] Department [illegible]

As [illegible]

[illegible]
31/8

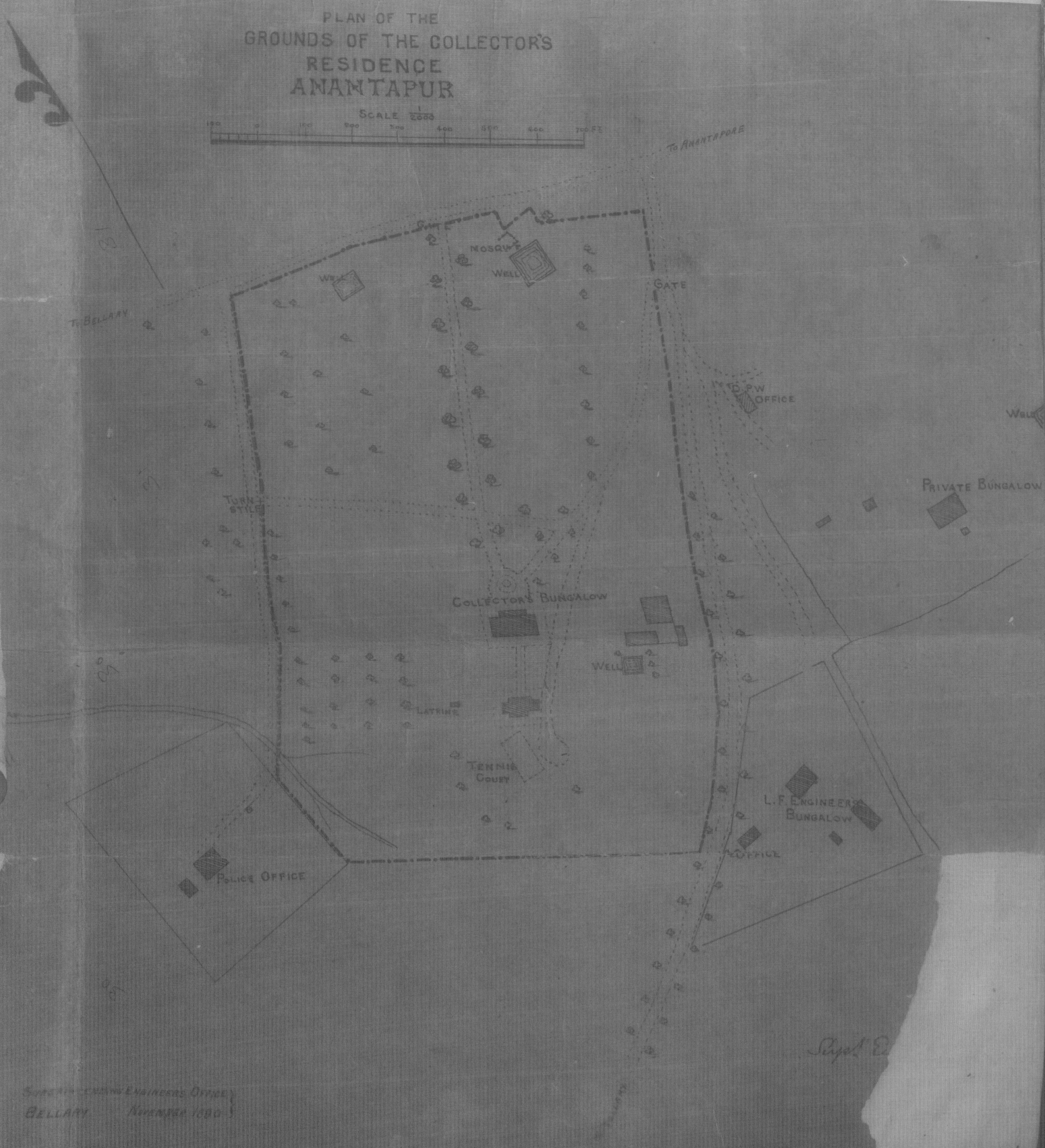
[illegible] specify the [illegible] reply to [illegible] No. 2931 of 24th [illegible]

Await reply to memo No. 2931 C dated 24th August 1893.

[illegible]
6/9

PLAN OF THE GROUNDS OF THE COLLECTOR'S RESIDENCE ANANTAPUR

SCALE $\frac{1}{2000}$



Supdt E.

SUPERINTENDING ENGINEER'S OFFICE
BELLARY NOVEMBER 1880

~~25~~ 36

No. 4798

Executive Engineer's Office,
Coimbatore Division,

25

Coimbatore 30 Decr 1893.

From
W. C. Lewis Esq:,
Executive Engineer,
Coimbatore Division.

To
The Superintending Engineer,
Fourth Circle, D.P.W.,
Coimbatore.

Enclosures.

Sir,

With reference to your Endorsement No. 515-C, dated 21st Instant, on Memorandum No. 4,022-C of 29th Ultimo, from the Chief Engineer P.W. Department, I have the honor to request you will be good enough to obtain one set of materials required for the heliographic printing process, as enumerated in the estimate printed therein.

I have the honor to be,
Sir,
Your most obedt Servant.

W C Lewis

Executive Engineer

No 16/M d/11 January 1894.

Forwarded to the Superintendent of Stationery through the Chief Engineer P.W. Department for favor of compliance.

J Harman
Supg Engineer 4th Circle.

~~26~~
37

P. W. CURRENT No. 241

P. W. D.

ENGINEER'S OFFICE P.W.D.
No. 7 C.G.
8 JAN.94
CIRCLE.

From

The Executive Engineer,
Coimbatore Division.

To

The Supg: Engineer
4th Circle
Coimbatore

Dated 30th
Despatched
Received
December 1893.
18.1.94

No. 4798

ENCLOSURES

SUBJECT.

Heliographic printing process —

Requests to obtain one set of materials required for —

No. 4022–23 Cd/29–11–93
3013 Wd/21–11–93
3569 Cd/2–11–93
3484 Cd/27–10–93
854 D d/15–9–93
2931 Cd/24–8–93
3668 Cd/6–11–93
3481 Cd/27–10–93

with the [illegible]

No. 190 Cd/18th January 1894

C

Recorded with the remark that the Estimate forwarded to the Supt: of Stationery includes one set of materials for each Executive Engineer.

The S.E. IV Circle 18/1/94
The S.E. IV Circle.

D 18/1/94

DESPATCHED
18 JAN 94

IND 794

3

From A. A. G. Malet Esq. Executi
Engineer Kistna Western 2nd Division to
the Superintending Engineer 2nd Circ
d/ 21st January 1893, No. 626 S.

With reference to your No. 2389 K.S. d/ 16th January 1894, I have the honor to request you will let me know if I am at liberty to indent for a set of materials. I would gladly start anything tha would expedite work in my drawin Office.

2. There is one point howeve which appears to me to requir clearing up.

3. Our plans are as a rule 30" x 22" where as the printing apparatu which it is proposed to supply i.e. the glass is only 26" x 20". As the drawing and printing very often come close to the edge of the paper, this size seems to me to be too small and that it would be better to err on the safe side and have the glass at least 30" x 22".

4. Two processes are proposed viz. (1) the Ferro Gallic & 2) Ferro Prussiate

prussiate. The width of the paper for the former is 40" and that for the latter 39". So they are amply wide enough to suit the larger size of glass.

5. I think this process will supply a long felt want as it is most desirable to have 3 sets of drawings.

One which may be the original on Vellum to be recorded in the Division Office.
One for the Sub Dn. Officer.
One for the subordinate in charge to be kept on the work.

No. 2587 KS / 1-2-94

Submitted to the Chief Engineer, P. W. Department, with reference to his Memo No. 4022 C of 29th November 1893, with a request to be informed whether indents may be submitted.

J W [illegible]
Supg Engineer
2nd Circle
31-1-94

P. W. CURRENT No. 7448

From, Col. A. Fraser R.E.
~~The~~ Superintending Engineer,
IIIrd Circle,
Bellary.

To,
The Chief Engineer
P.W.D.
Madras

Dated 29
Received 30 August 1893.

Enclosures.

No. 1423

Subject.

[illegible] or photographic
copying of plans

Regarding

No 563W. d/ 2nd March 1894

PUBLIC WORKS DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

42

42

READ the following

Pros: in the Finl. Dept: H.E. No 153 d/ 22d Feby: /94

40

Communicated to officers of the P.W. Dept. in continuation of No. 4022 C d/ 29th November /93

2. It will be seen that the materials for the new process will be included by the Supt. of Stationery in his next indent on the Home Government and that the articles will, in due course, be distributed. Suptg: Engineers will, after a year's trial, report on

on the success or other-wise of the new process and the savings resulting therefrom.

ovd
27.2.94

[illegible]
14 91

despd

Suptg: Engrs. ✓
Cons: Archt ✓
Supt: of Works. ✓ P.P.
Chief Engr: for Engn:

1469

Govt. of 1189 Madras.
PUBLIC WORKS.

2/3/ 4 563W.

rro-prussiate
nd ferro-gallic
rocesses of copying
lans.

roceedings
nancial dept
n correspondence
relative to the
adoption of the
n the P.W. Dept,
communicated
to officers of the department

with instructions
that after a
year's trial
a report be
submitted on
the success or
otherwise of
the new process
and the saving
resulting
therefrom