deflection, then

$$W(\text{work stored in the spring}) = \int_{y=0}^{y=y} Ky = \frac{K}{2}y^2$$

where y = the limiting deflection of the spring. Thus, if we re-arrange the equation

$$y = \frac{Pl^3}{3EI}$$

to the form

$$\frac{3EI}{l^3} = \frac{P}{y} = K = \frac{3\pi E d^4}{l^3}$$

we find that

$$K = \frac{3\pi(26 \times 10^6 \ \#/in^2)([illegible])^4}{[illegible]^3} = 119{,}500 \ \#/in.$$

[illegible] of this, the work stored by a deflection of 0.00924 would be

$$\frac{1}{2}(119{,}500 \ \#/in)(0.00924)^2 = 5.08 \text{ in-lbs.}$$

or

$$\frac{5.08 \text{ in-lbs}}{12 \frac{in}{ft}} = 0.423 \text{ ft-lbs}$$

of energy. [illegible] would limit the velocity of the drum to

$$0.423 = \frac{10.17 \ \omega^2}{2(32)}$$

$$\left[\frac{64(0.423)}{10.17}\right]^{1/2} = \omega = [2.75]^{1/2} = 1.66 \text{ rads./sec.}$$

This would mean that the task when the [illegible] [illegible] sent [illegible] [illegible] assembly speed from 150.8 rads. of the [illegible] would [illegible] reduce the [illegible] [illegible] after which the [illegible] would take care of the [illegible] to 1.66 rad./sec. [illegible] assembly to a full stop.

[illegible] of [illegible] [illegible] [illegible]

Assuming the use of a [illegible] horsepower motor drive and assuming a [illegible] [illegible] before Drum #2 is properly positioned for black-and-white [illegible], let us now proceed to the design of the second positioning assembly.

The velocity of the Drum #2 assembly at the end of the above-mentioned 120° travel can be [illegible] by applying the ratio of the specified motor $\frac{hp}{}$ to the computed required motor, to the acceleration on which the computed motor is based. Since the computed required motor would raise the speed of the Drum Assembly from zero to 150.8 radians/sec. in 60 secs., or a acceleration of

$$150.8 = \tfrac{1}{2}\, a\,(60)$$

$$\frac{2(150.8)}{60} = 5.03 \text{ rads/sec}^2$$

Using a 0.125 hp motor in the place of the 0.105 hp computed requirement, we may [illegible]

$$\left(\frac{0.125\ hp}{0.105\ hp}\right)\left[5.03 \text{ rads/sec}^2\right] = 5.98 \text{ rads/sec}^2$$

[illegible] the acceleration which the specified motor would apply. The 120° arc of travel [illegible] a travel of

$$\frac{120}{360}(2\pi) = \tfrac{2}{3}\pi \text{ radians}$$

The [illegible] acceleration of 5.98 rads/sec² would be [illegible] [illegible] in the motivating [illegible] assembly [illegible] 2 [illegible] (since [illegible] of the 2 [illegible] is involved), meaning [illegible] [illegible] [illegible] of the [illegible] (assuming the same motor output [illegible]) the acceleration of the #2 Drum [illegible] would be

$$2(5.98) = 11.96 \text{ rads/sec}^2$$

By

$$s = \tfrac{1}{2} a t^2$$

$$\tfrac{2}{3}\pi = \tfrac{1}{2}(11.96)(t^2)$$

$$t = \left[\frac{2(2\pi)}{3(11.96)}\right]^{1/2} = 0.35^{1/2} = 0.592 \text{ secs}$$

[illegible] [illegible] required to move [illegible] the [illegible] arc, [illegible]

$$\tfrac{1}{2} a t = \tfrac{1}{2}(11.96)(0.592) = 3.54 \text{ rads/sec}$$

[illegible] be the [illegible] velocity at the conclusion of the arc of travel. The fact [illegible] [illegible] [illegible] the latch [illegible] positions Drum #2 [illegible] with respect to Drum #1 may be [illegible]. These two [illegible] [illegible] of the two functions which the latch serves :- (1) firstly, it serves to stop and position Drum #2 with respect to Drum #1 when black-and-white viewing is intended, and (2) it is the means by Drum #1 is motivated along with Drum #2 in color-viewing. In stopping Drum #2 after ~~that~~ Drum #1 has already been positioned, it must absorb the flywheel energy of Drum #2. This would mean, since $\Sigma m r^2$ for each Drum has been taken at 5.0 ~~8~~5 lb-ft^2, that

$$\frac{(5.085 \text{ lb-ft}^2)}{(2)(32 \frac{ft}{sec^2})}(3.57 \text{ rads./sec})^2 = 0.382 \text{ ft-lbs.}$$

of energy [illegible] have to be absorbed. By reference to the previous calculations [illegible] the pin which positions Drum #1, it is clear that a member [illegible] the pin which positions Drum #1, it is clear that a member would more than [illegible] equal to a 1/4 [illegible] round [illegible] suffice for this service. If it were [illegible] than the [illegible] pin, it would become [illegible] for the design of the latch member, it would [illegible] equal to

$$\frac{(0.0 \text{[illegible]} \text{ lb-ft}^2)}{(32 \text{ ft/sec}^2)}[\text{[illegible] rads/sec}] = 1.871 \text{ ft-lbs.}$$

or

$$(1.871 \text{ ft-lbs})(12 \frac{in}{ft}) = 22.45 \text{ in-lbs.}$$

[illegible] located on about a 13" radius from [illegible], the torque indicated above implies a load of

$$\frac{22.45 \text{ in-lbs}}{13 \text{ in}} = 1.728\#$$

applied to the end of the latch. Were the latch 2" long, this would mean the inducing of a bending load of

$$1.728(2) = 3.456 \text{ in-lbs.}$$

which is in fact insignificant and worthy of no further computations.

The next [illegible] question of the shafting by which the Drums are mounted. On consideration of the loads involved, it is practical, from a superficial observation, to think in terms of a cantilever shafting mounting of the Drums from one end as per the figure below:-

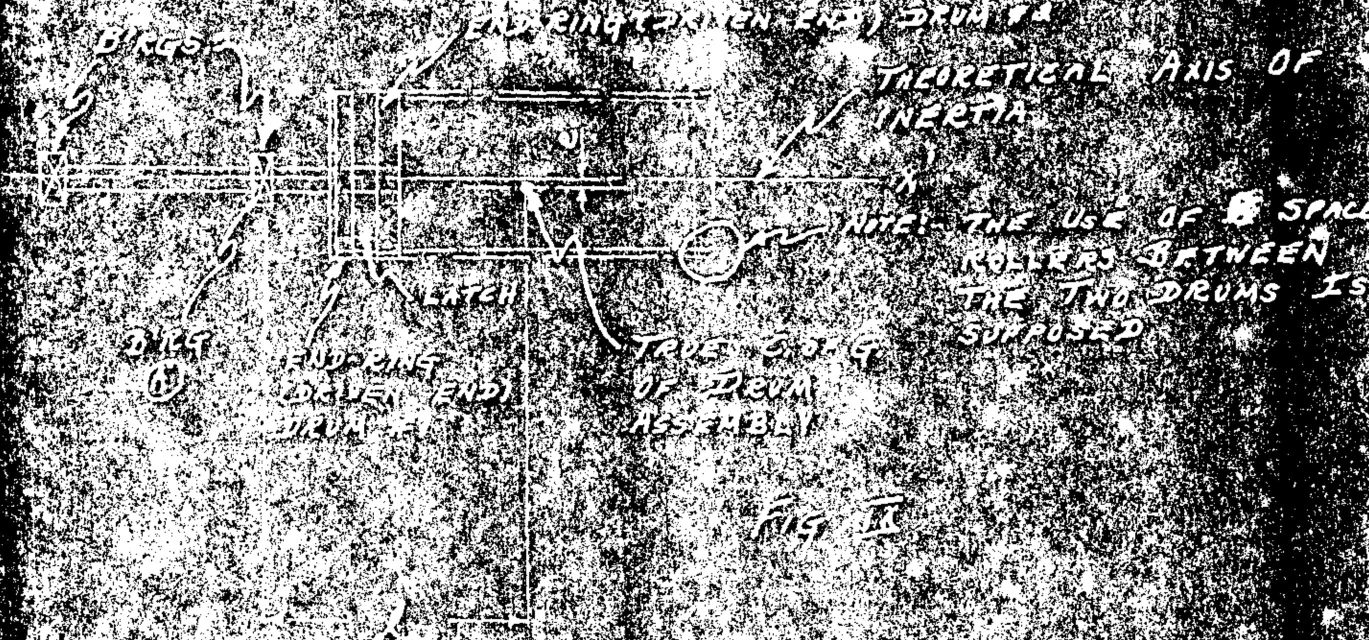


FIG IX

As portrayed above, the double drum assembly is considered as a single [illegible] to the load [illegible] principle. [illegible] the length of the shaft being taken as equal to the span between Brg (A) and the True Center of Gravity of the combined drum assembly. [illegible] rollers as indicated contribute [illegible] of this component.

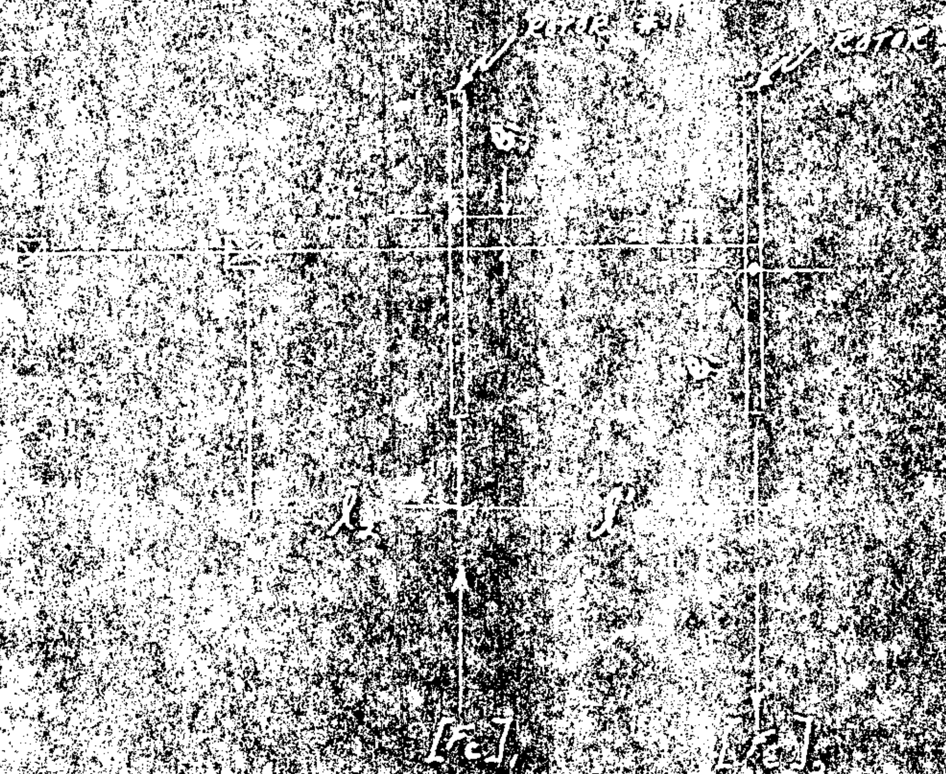
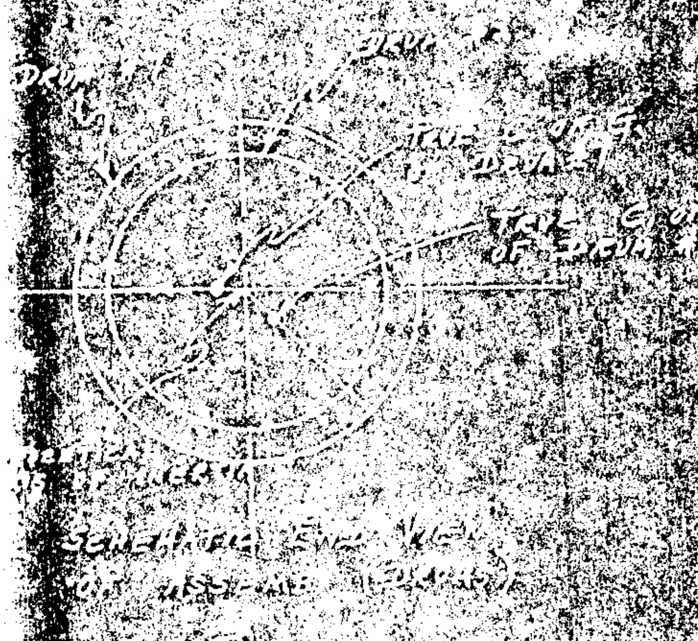


FIG 10



The diagram taken above is, fundamentally, a simplified and idealized one. This is in opposition to the view [illegible] considering the shaft to carry [illegible] concentrated loads. Considering the shaft as carrying two such concentrated loads, there is [illegible] two possibilities (assuming [illegible] to have been fabricated [illegible] tolerances so as to balance). These possibilities are illustrated in Figs. 10 and 11.

Fig. 10 illustrates the situation in which two rotors of identical weight having diametrically opposed identical eccentricities are mounted on the same shaft.

And Fig. 11 illustrates the situation in which two rotors of identical weight have their identical eccentricities acting in different axial planes.

[illegible] Fig. 10 [illegible] rotors that since the eccentricities [illegible] exert a centrifugal force [illegible] of magnitude

$$F_1 = F_2 = \frac{W}{g}\omega^2 e$$

[illegible] act in opposite directions. In consequence of their diametrically opposite eccentricities, they would constitute a rotational moment (couple) [illegible] of magnitude

$$\frac{W}{g}\omega^2 e l$$

[illegible] would [illegible] each end [illegible] to the left ($l/2$) to an [illegible] to the right ($l/2$) to a downward [illegible] would present [illegible] would consequently result in different [illegible]

[illegible] of different [illegible] the [illegible] of different magnitude at $x = l_2$ [illegible], since these different magnitudes would alter the relative magnitudes of (F_{c_1}) and (F_{c_2}) the couple would be destroyed; and [illegible] would resolve into that shown pictorially below:-

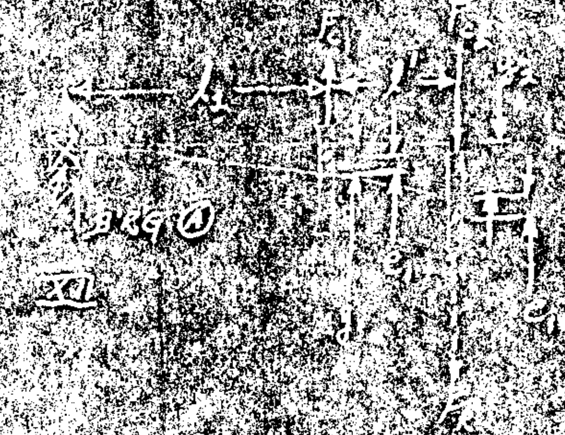


Fig. XI

[illegible] the forces (F_{c_1}) and (F_{c_2}) can be [illegible] according [illegible]

$$\frac{(F_{c_1})(l' + l_2) - (F_{c_2})\, l'}{(l_2 + l')} = F_R$$

[illegible] a resultant force (F_R) acting [illegible] a distance of ($l_2 + l'$) from [illegible] section of the beam would thus [illegible] (3). The moment acting on any [illegible]

$$M = F_R\,(l' + l_2 - x) = EI\,\frac{d^2y}{dx^2}$$

[illegible] after [illegible] integration, would take the form

$$y = \frac{F_R}{EI}\left(\frac{(l' + l_2)\,x^2}{2} - \frac{x^3}{6}\right)$$

[illegible] K value

$$K = \frac{EI}{\left[\frac{(l' + l_2)\,x^2}{2} - \frac{x^3}{6}\right]}$$

[illegible] Fig. XI, it follows that

$$F_{c_1} = \frac{W}{g}\,(y_1 - e)\,\omega^2$$

and

$$F_{c_2} = \frac{W}{g}(y_2 + e_1)\omega^2$$

Moreover, since

$$F_{c_1} + F_{c_2} = K y_2$$

we may write

$$\frac{W}{g}(y_1 - e_1)\omega^2 + \frac{W}{g}(e_1 + y_2)\omega^2 = K y_2$$

which will reduce to

$$\omega^2 (y_1 + y_2) = \frac{Kg}{W} y_2$$

$$\frac{\omega^2 y_1}{\frac{Kg}{W} - \omega^2} = y_2 = \frac{y_1}{\frac{\left(\frac{Kg}{W}\right)}{\omega^2} - 1}$$

The significance of the final equation are —

1) as (ω^2) approaches $\left(\frac{Kg}{W}\right)$ in value, (y_2) would attain infinitely large values, becoming infinite when $\omega^2 = \frac{Kg}{W}$ (i.e. the shaft would fail), and

2) since (y_2) is expressed in terms of (y_1) with $\left[\frac{Kg}{W\omega^2} - 1\right]^{-1}$ as a modifier of (y_1), it is clear that when $\omega < \left(\frac{Kg}{W\omega^2}\right)$ but opposite the latter is unexpected, then the portion of the shaft beneath Rotor #1 is in deflected position, while, when $\omega > \left[\frac{Kg}{W\omega^2}\right]$, the form that equation becomes

$$y_2 = \frac{y_1}{1 - \frac{Kg}{W\omega^2}}$$

means that the portion of the shaft above Rotor #2 becomes the critical portion.

The critical speed [illegible] of a shaft is equally [illegible], but [illegible] as two [illegible] [illegible] would [illegible] loads, [illegible] a single [illegible] greater load would [illegible] the distance separating the two [illegible] virtually [illegible] $(l_1 + l_2)$ [illegible] connecting [illegible] length tends to stiffen the shaft and [illegible] the deflection relationship.

between (y_1) and (y_2) in favor of those set down by the normal static relationships, the conclusions drawn above, however, from the dynamic relationships between (y_1) and (y_2) [illegible] against any attempt to operate at speeds greater than the first resonance speed, and in fact, these relationships speak in favor of staying substantially beneath the first resonance speed. Hence, in dealing with the [illegible] [illegible] as a single concentrated load, we shall [illegible] according to [illegible] the critical speed as established by the "single concentrated load" Equations.

Returning again to Fig. IX, let:

$W = 10.17$ #

$l = 14$"

$S = 15{,}000$ #/in.^{2}

$\omega = 150.8$ rad./sec.

E = [illegible] diameter with the shaft diameter of [illegible] $0.005(28) = 0.14$"

$g = \left[32 \frac{ft}{sec^2}\right]\left[12 \frac{in}{ft}\right] = 384$ in./sec.^{2}

$E_T = 3.0(10^7)$ lbs./in.^{2} [illegible]

Then using Eq. [illegible] "[illegible] from [illegible] [illegible]"

$$\frac{\pi S g d^3}{32\, l W \omega^2} - E d - \frac{S l^2}{3 E_T} = 0$$

$$\frac{\pi\,(15000)(384)\,d^3}{32\,(14)(10.17)(150.8)^2} - 0.14\,d - \frac{(15{,}000)(14)^2}{3\,(3.0)(10^7)} = 0$$

$$0.175\,d^3 - 0.14\,d - 0.1757 = 0$$

$$d^3 - 0.8\,d - 0.43 = 0$$

In the [illegible] equation,

$A = 0$; $A = +0.0$

$B = 0$; $B = +0.0$

$4C = -0.8$; $C = -0.2$

$D = -0.43$; $D = -0.43$

Then solving

$A - B = 0 - 0 = 0$

$y = E^2 + C^3 - 2ABC + 2g = 0 + 0.04 - 0 + 0 = 0.04$

$k = \frac{1}{3}AC - B - \frac{1}{3}D = [illegible]\ 0.04 + \frac{.43}{3} = 0.143$

$l = \frac{1}{2}\left[h + \left[h^2 + k^3\right]^{1/2}\right]^{1/3} + \frac{1}{2}\left[h - \left[h^2 + k^3\right]^{1/2}\right]^{1/3} =$

$= \frac{1}{2}\left[0.04 + (.0016 + 0.0029)^{1/2}\right]^{1/3} + \frac{1}{2}\left[0.04 - (0.0016 - 0.0029)^{1/2}\right]^{1/3} =$

$\frac{1}{2}\left[0.044 + 0.164\right] + \frac{1}{2}\left[0.04 + 0.108\right] =$

$0.102 + 0.074 = 0.176$

$u = g + l = 0 + 0.176 = 0.176$

$v = g + l = 0 + 0.176 = 0.176$

$w = 4u^2 + 3k - 12gl = 4(0.176)^2 + 3(0.143) - 12(0) =$

$= 4(0.031) + 0.429 = 0.124 + 0.429 = 0.513$

Thus, the four roots would be:-

$d_1 = -A + u^{1/2} + (v + w^{1/2})^{1/2}$

$d_2 = -A - u^{1/2} + (v - w^{1/2})^{1/2}$

$d_3 = -A + u^{1/2} - (v + w^{1/2})^{1/2}$

$d_4 = -A - u^{1/2} - (v - w^{1/2})^{1/2}$

and so

$d_1 = 0 + 0.176^{1/2} + (0.176 + 0.573^{1/2})^{1/2} = 0.42 + (0.176 + 0.758)^{1/2}$

$= 0.42 + 0.934^{1/2} = 0.42 + 0.966 = 1.386''$

By inspection, the four other roots would lie in the realm of imaginary or impractical values. Checking,

$d^4 - 0.8d - 0.43 = 0$

~~[illegible]~~

$1.386^4 - 0.8(1.386) - 0.43 = 0$

$3.69 - 1.108 - 0.43 \neq 0$

which means the above value is incorrect. Taking (l) as follows:-

$l = \frac{1}{2}\left[h + (h^2 + k^3)^{1/2}\right]^{1/3} + \frac{1}{2}\left[h - (h^2 + k^3)^{1/2}\right]^{1/3} =$

$\frac{1}{2}\left[0.04 + .164 + \frac{1}{2}(0.04 - 0.104)\right] =$

$= \frac{1}{2}\left[0.204 - \frac{1}{2}(0.124)\right] = [0.204 - 0.062]\,1/2 =$

$\frac{1}{2}[0.142] = 0.071$

$u = 0.071$

$v = 0.071$

$w = 4(0.071)^2 + 0.43 = 4(0.005) + 0.43 =$

$0.02 + 0.43 = 0.45$

$d_1 = 0.071^{1/2} + (0.071 + 0.45^{1/2})^{1/2} = 0.276 + (0.071 + 0.67)^{1/2}$

$= 0.276 + 0.741^{1/2} = 0.276 + 0.86 = 1.136''$

Checking,

$d^4 - 0.8d - 0.43 = 0$

$1.66 - 0.8(1.136) - 0.43 = 0$

$1.66 - 0.9088 - 0.43 = 0$

Again, taking

$u = \frac{1}{2}\left[h + (h^2 + k^3)^{1/2}\right]^{1/3} + 1/2\left[h - (h^2 + k^3)^{1/2}\right]^{1/3} =$

$\frac{1}{2}[0.204] + \frac{1}{2}[-0.124] = 0.102 - 0.062 = 0.04$

$u = 0.04$

$v = 0.04$

$w = 4(0.04)^2 + 0.43 = 4(0.0016) + 0.43 =$

$0.0064 + 0.43 = 0.4364$

$d_1 = 0.04^{1/2} + (0.04 + 0.4364^{1/2})^{1/2} =$

$0.2 + (0.04 + 0.66)^{1/2} = 0.2 + 0.7^{1/2} =$

$0.2 + 0.835 = 1.035''$

Checking

$d^4 - 0.8d - 0.43 = 0$

$1.17 - 0.8(1.035) - 0.43 = 0$

$1.17 - 0.828 - 0.43 = 0$

The answering may be taken to be within the limits of slide-rule accuracy; and we would use a 1⅛" shaft, if all other design factors check, as the nearest standard.

We previously found the torque in accelerating the drum to be of the order of 22.45 in-lbs. Taking the "shock-torque" to be 1.5 times this value, according to Eq. 56 of "Shafting From A Dynamic Viewpoint",

$$22.7\left[\frac{M_t}{S}\right]^{1/3} = 22.7\left[\frac{22.45(1.5)}{12(10^3)}\right]^{1/3} =$$

$$0.227\left[\frac{33.675}{12}\right]^{1/3} = 0.227(1.415) = 0.321'' \;\&$$

shaft would be required to yield not more than a 1°/20 diameters of shafting twist. Finally, we find, by Eq. 58 of "Shafting From A Dynamic Viewpoint",

$$\frac{16 M_t}{\pi d^3} = S_s$$

if again we set M_t = to the shock torque and $d = 1.125''$ (as previously suggested)

$$\frac{16(1.5)(22.45)}{\pi(1.125)^3} = \frac{24(22.45)}{\pi(1.42)} = 121 \;\#/\text{in.}^2$$

would give the shear stress due to torsion. The combined stress due to torsion and bending would thus be

$$\left[15000^2 + 121^2\right]^{1/2} = \left[2.25(10^8) + 1.47(10^4)\right]^{1/2} =$$

$$15000 \;\#/\text{in.}^2$$

and hence, a 1 1/8" diameter shaft satisfies the principle design conditions. Let us however check the value of resonance speed which we would expect. The resonance speed is given by $\left[\frac{Kg}{W}\right]^{1/2}$ according to Eq. (?) of "Shafting From A Dynamic Viewpoint". Since

$$K = \frac{3EI}{L^3} = \frac{3(30)(10^6)(\pi)(1.125)^4}{64(14)^3} =$$

$$\frac{90(10^6)(\pi)(1.57)}{64(2720)} = 2210 \;\#/\text{in}$$

then

$$\left[\frac{Kg}{W}\right]^{1/2} = \left[\frac{2210(386)}{10.17}\right]^{1/2} = \left[83500\right]^{1/2} = 914 \text{ oscill. per } 2\pi \text{ sec.}$$

By

$$y = \frac{e}{\frac{\omega_c^2}{\omega^2} - 1}$$

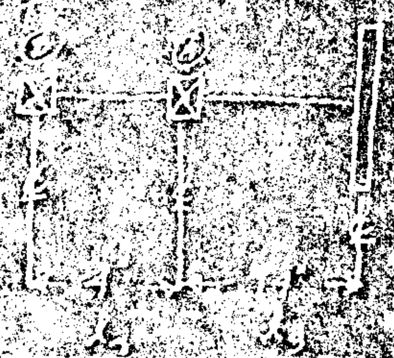
as per Eq. (50) of "Shafting from a Dynamic Viewpoint",

$$y = \frac{e}{\left(\frac{714}{127.8}\right)^2 - 1} = \frac{e}{36.8 - 1} = \frac{e}{35.8}$$

and since e = 0.14, then

$$y = \frac{0.14}{35.8} = 0.00391$$

The [illegible] is the function of the bearings and bearing spacings - assume a 4" spacing (for [illegible] [illegible]) between the two main bearings.



The computed shafting requirement at a stress of 15,000 psi was 1.055". The moment which such a shaft would withstand at the given stress would be

$$M = SZ = S\pi d^3/32 =$$

$$\frac{15{,}000(\pi)(1.055)^3}{32} = \frac{15000(\pi)(1.12)}{32} =$$

1650 in lbs

Taking moments about (A),

$$\frac{M}{l_1} = \frac{1650}{4} = 412.5\ \# = \text{load on brg (B)}$$

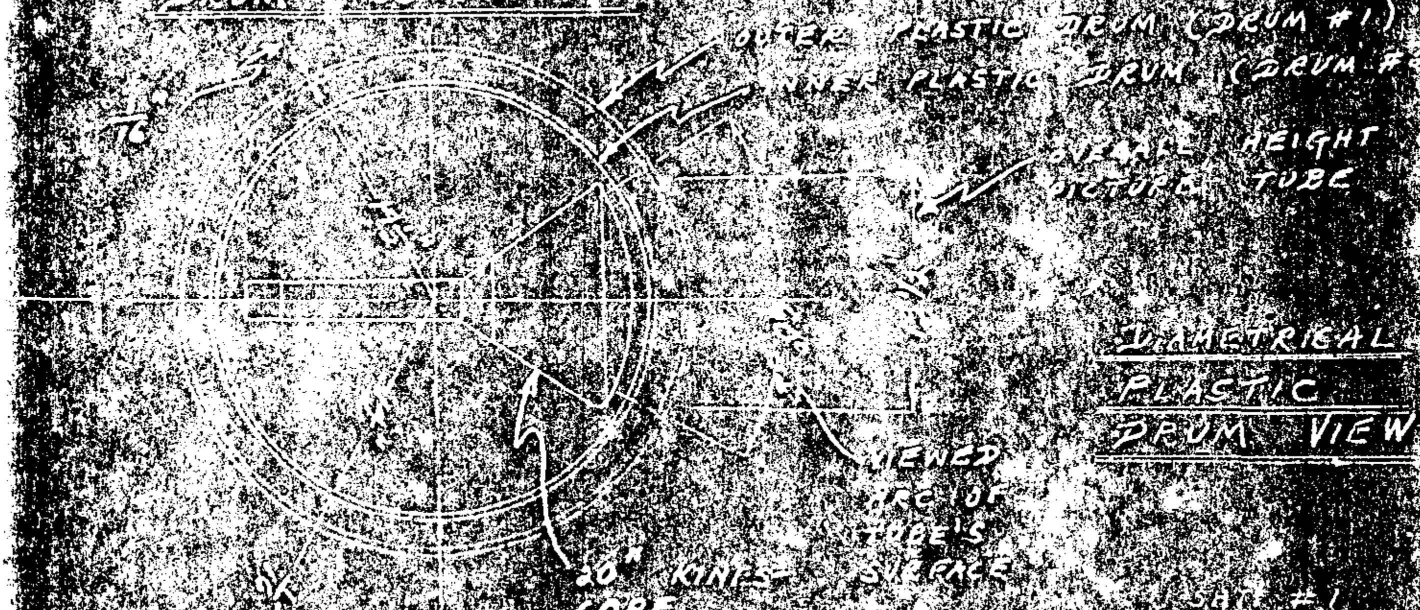
Taking moments about (B),

$$\frac{M(l_1+l_2)}{l_1 l_2} = \frac{1650(11+4)}{11(4)} = 5[illegible]\ \# = \text{load on brg (A)}$$

The foregoing covers the principal computations; such others as will be required will follow as part of the layout computations.

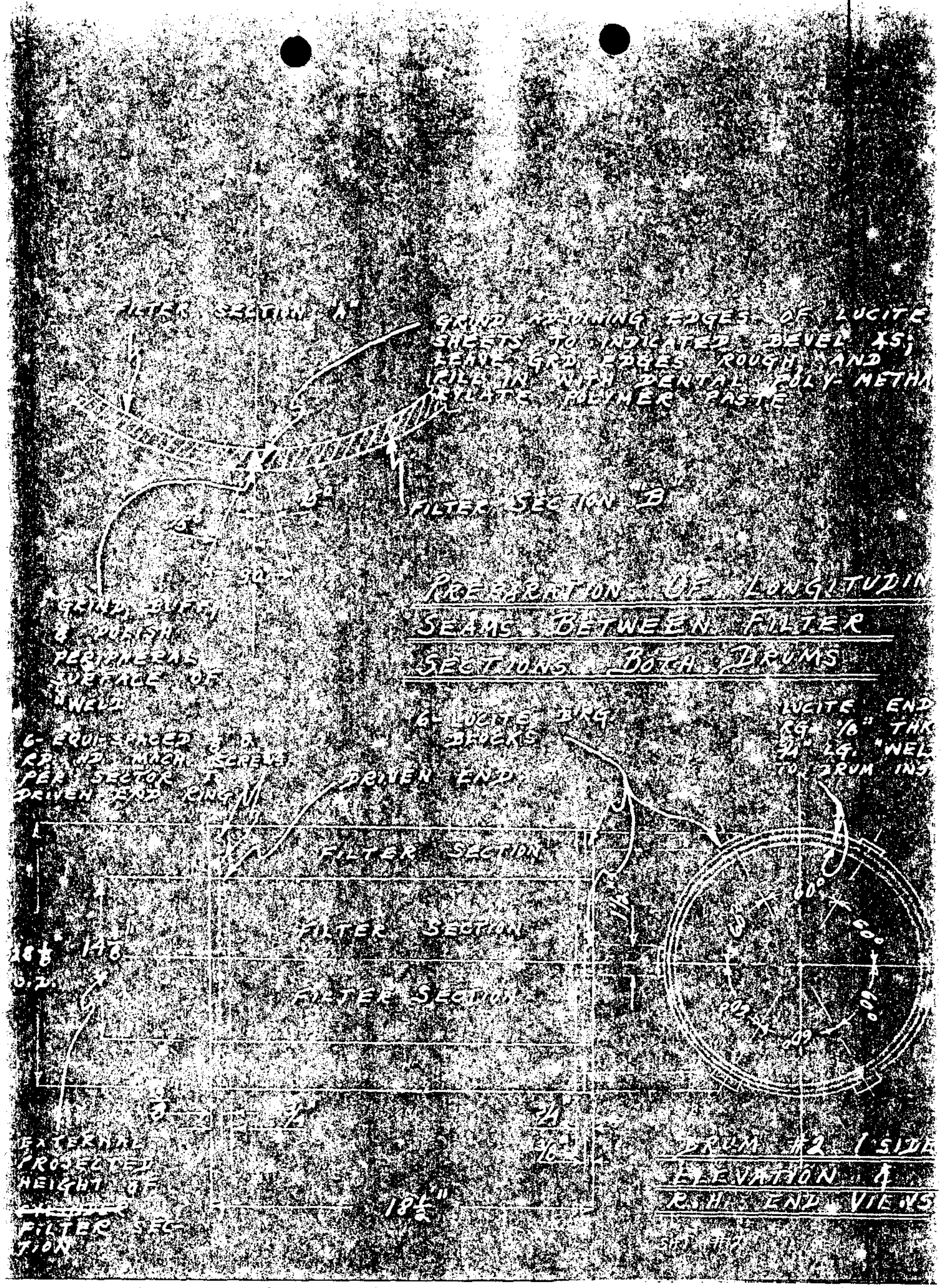
LAYOUT SKETCHES FOR 20" TUBE

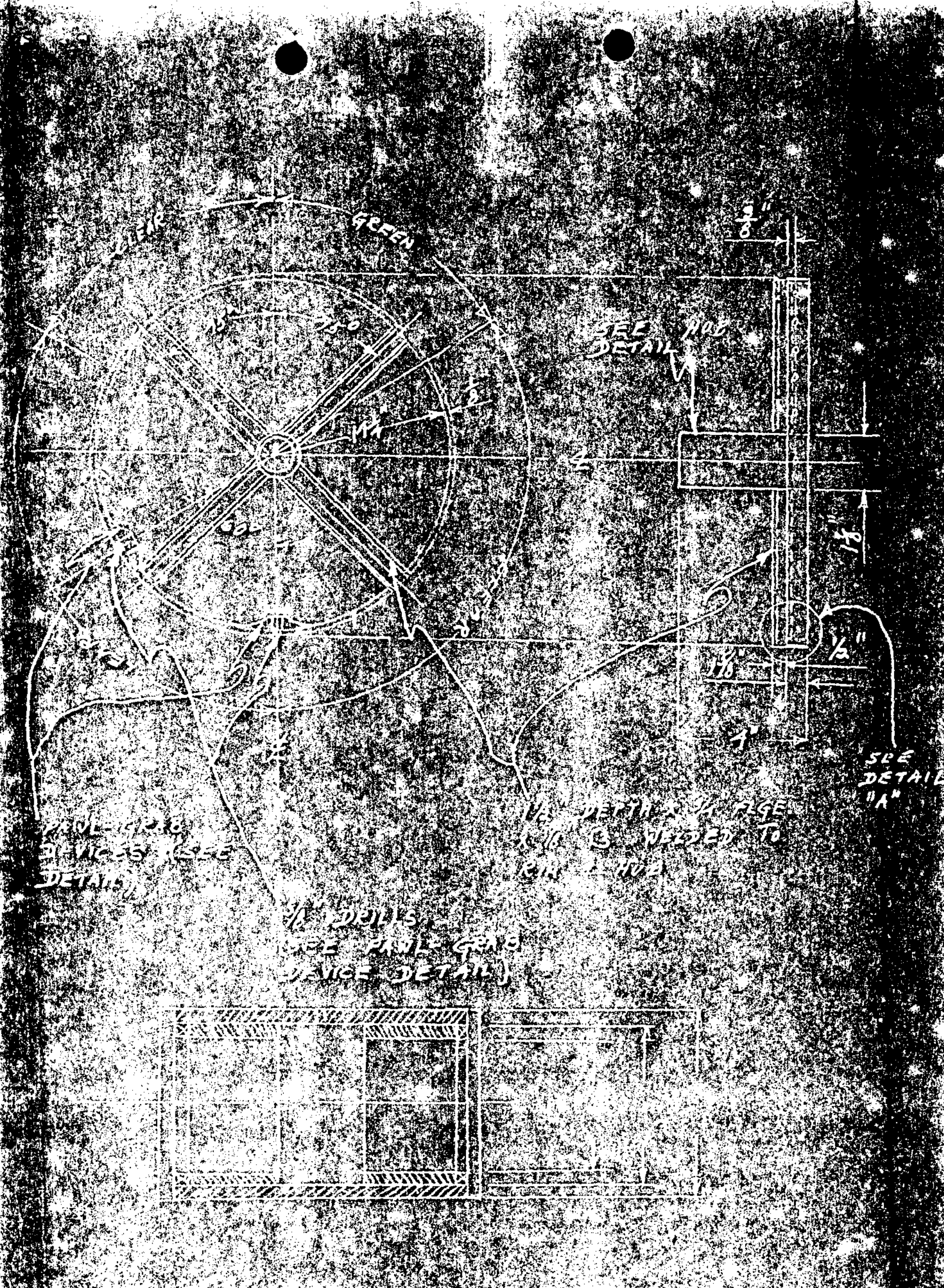
SCHEMATIC SHOWING ARRANGEMENT OF FILTER SECTORS ON DOUBLE DRUM ASSEMBLY

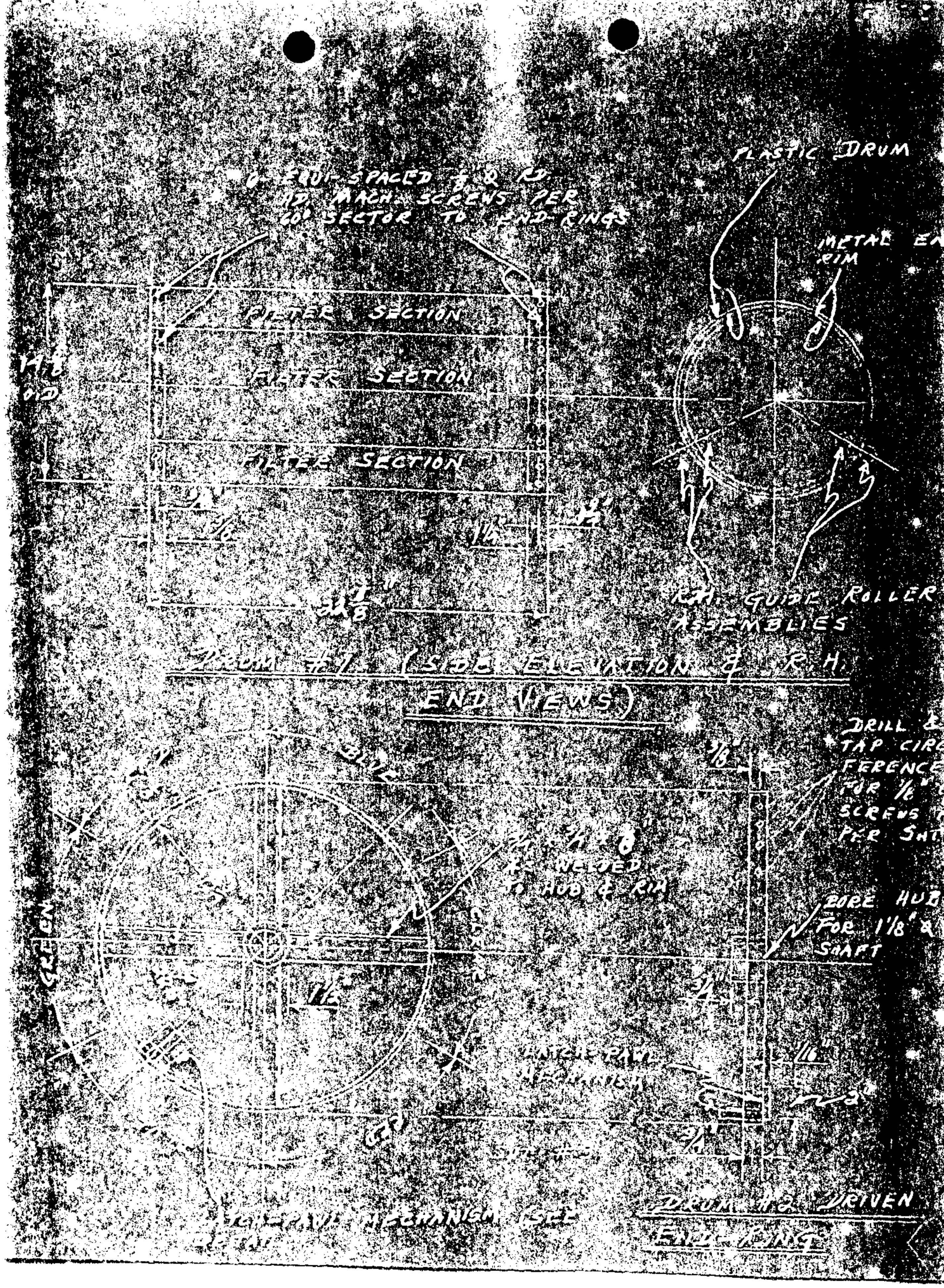


DIAMETRICAL PLASTIC DRUM VIEW

SHT #1

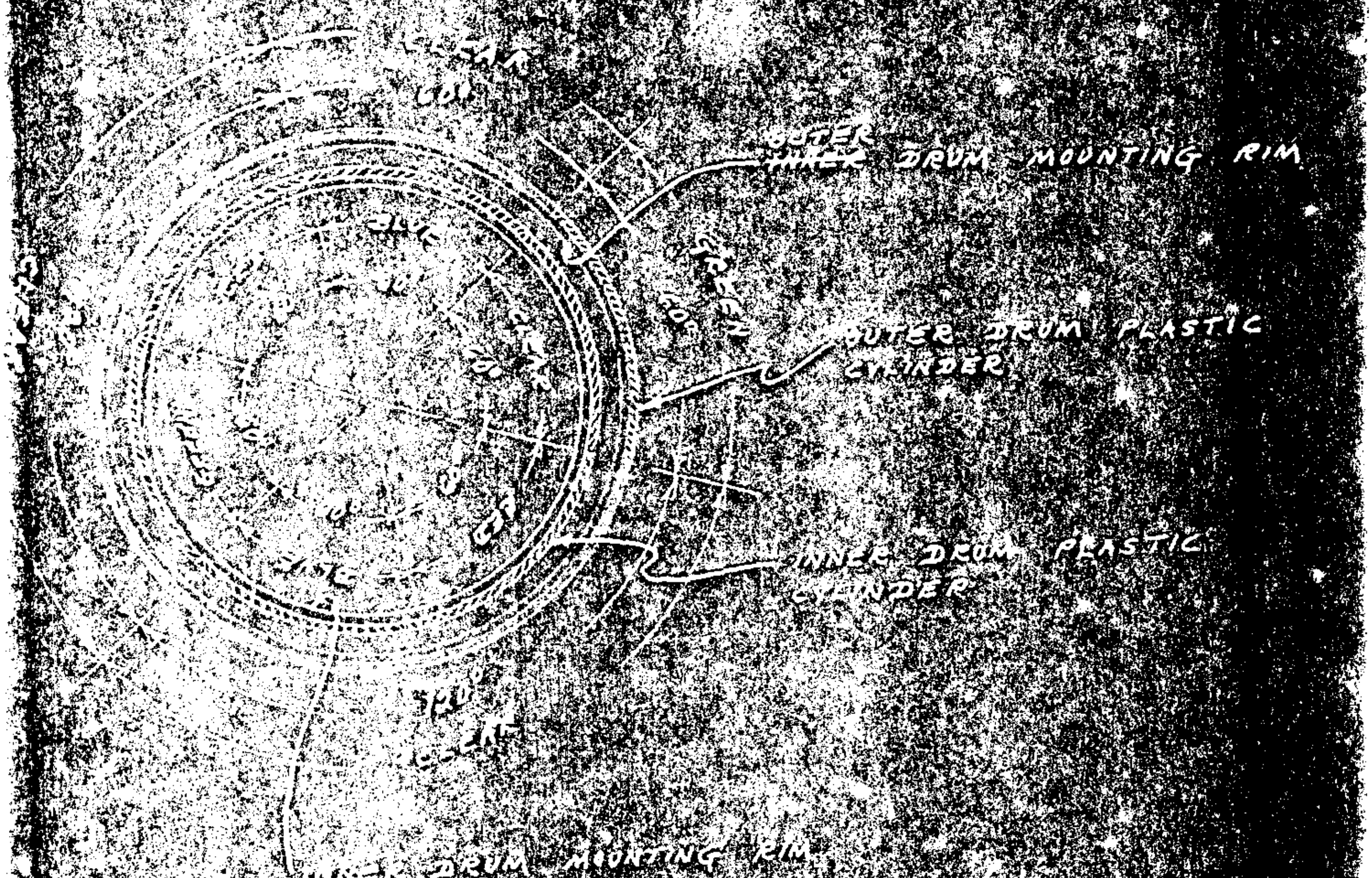

FILTER SECTION "A"
GRIND ADJOINING EDGES OF LUCITE
SHEETS TO INDICATED BEVEL 45°;
LEAVE GRD. EDGES ROUGH AND
FILL IN WITH DENTAL POLY-METH
YLATE POLYMER PASTE
FILTER SECTION "B"
90°
GRIND, BUFF
& POLISH
PERIPHERAL
SURFACE OF
WELD
PREPARATION OF LONGITUDIN
SEAMS BETWEEN FILTER
SECTIONS BOTH DRUMS
16-LUCITE BRG.
BLOCKS
LUCITE END
RG. 1/8" THK
3/4" LG. WEL
TO DRUM INS
6-EQUI-SPACED
RD. HD. MACH. SCREWS
PER SECTOR &
DRIVEN END RING
DRIVEN END
FILTER SECTION
FILTER SECTION
FILTER SECTION
18 1/8" O.D.
14 1/8
60°
60°
60°
60°
60°
60°
3/4
3/4
1/16
18 1/2"
EXTERNAL
PROJECTED
HEIGHT OF
FILTER SEC-
TION
DRUM #2 (SIDE
ELEVATION &
R.H. END VIEWS


GREEN
SEE HUB DETAIL
SEE DETAIL "A"
DEVICE DETAIL)

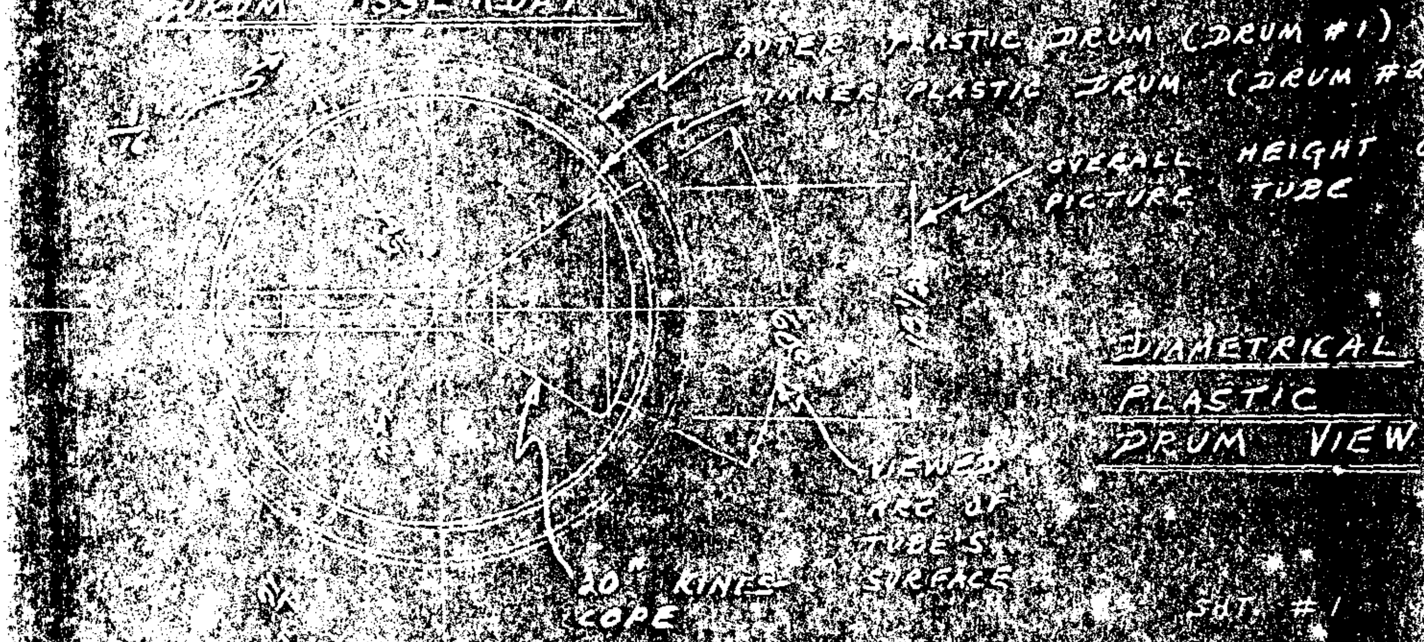


PLASTIC DRUM
METAL END RIM
FILTER SECTION
FILTER SECTION
FILTER SECTION
MACH. SCREWS PER
60° SECTOR TO END RINGS
R.H. GUIDE ROLLER ASSEMBLIES
DRUM #1 (SIDE ELEVATION & R.H. END VIEWS)
DRILL &
TAP CIRC
FERENCE
FOR 1/8"
SCREWS
PER SHT
WELDED
HUB & RIM
BORE HUB
FOR 1 1/8" SHAFT
PAWL MECHANISM
DRUM #2 DRIVEN
END RING

LAYOUT SKETCHES FOR 20" TUBE

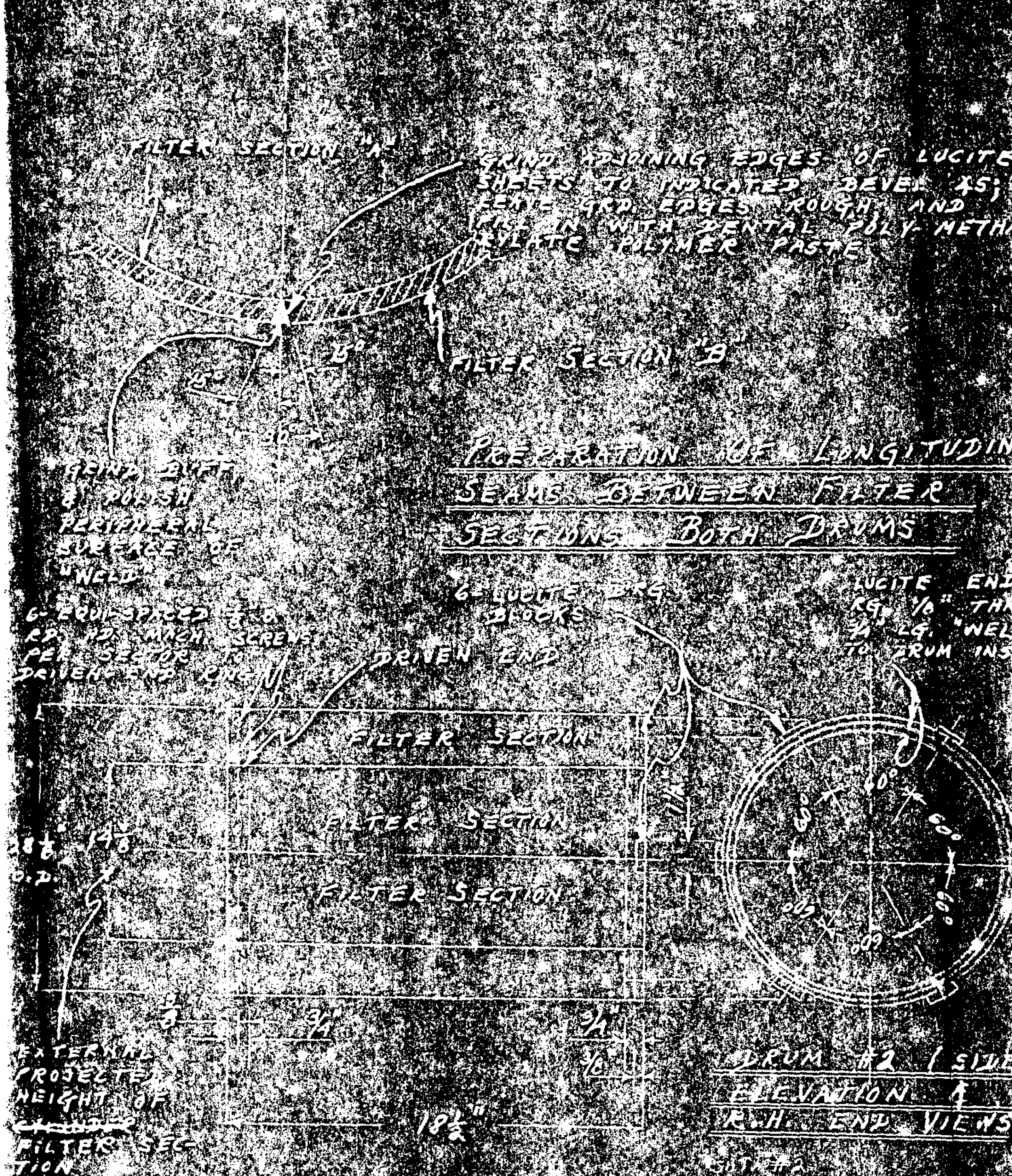


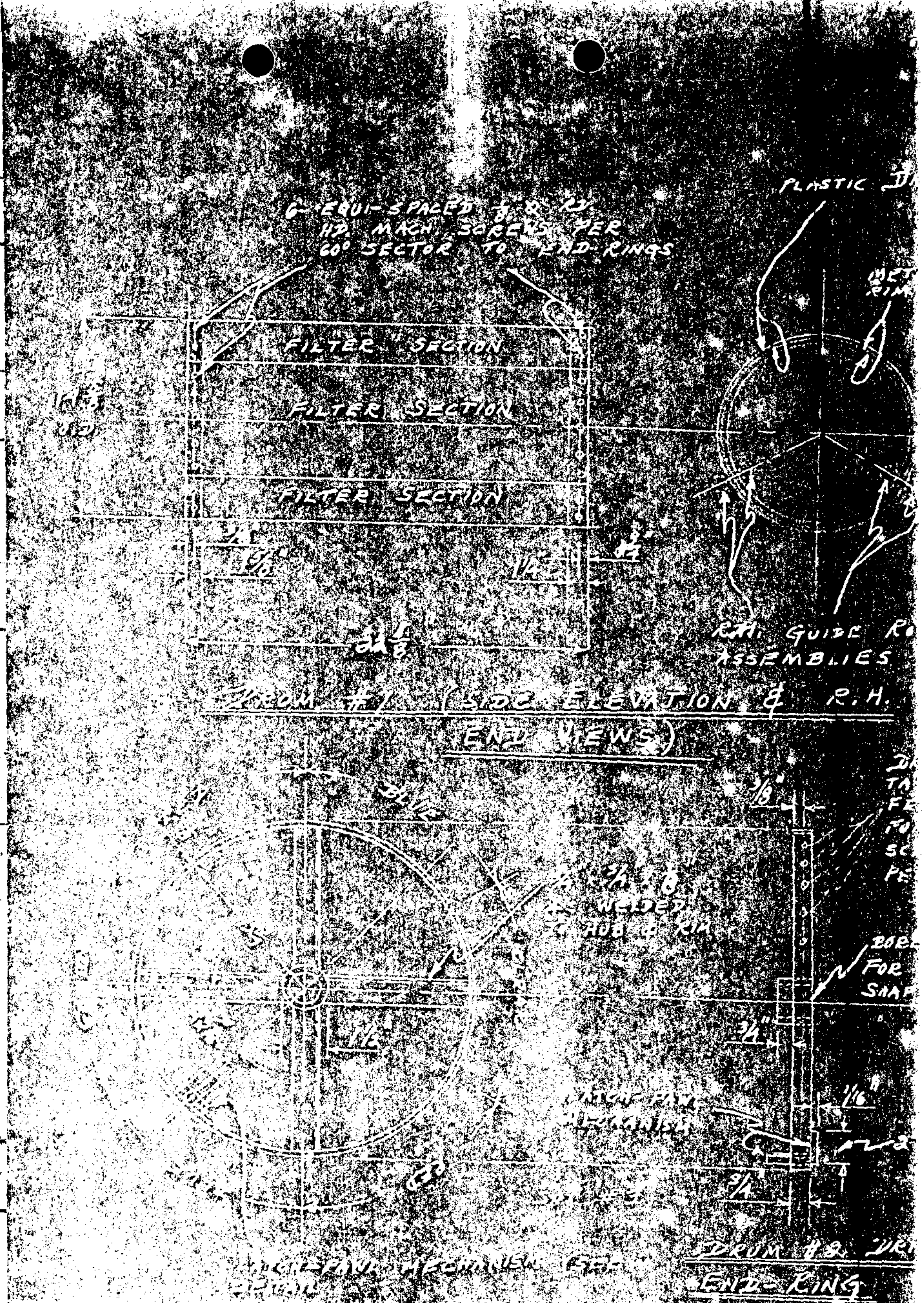
SCHEMATIC SHOWING ARRANGEMENT OF FILTER SECTORS ON DOUBLE DRUM ASSEMBLY



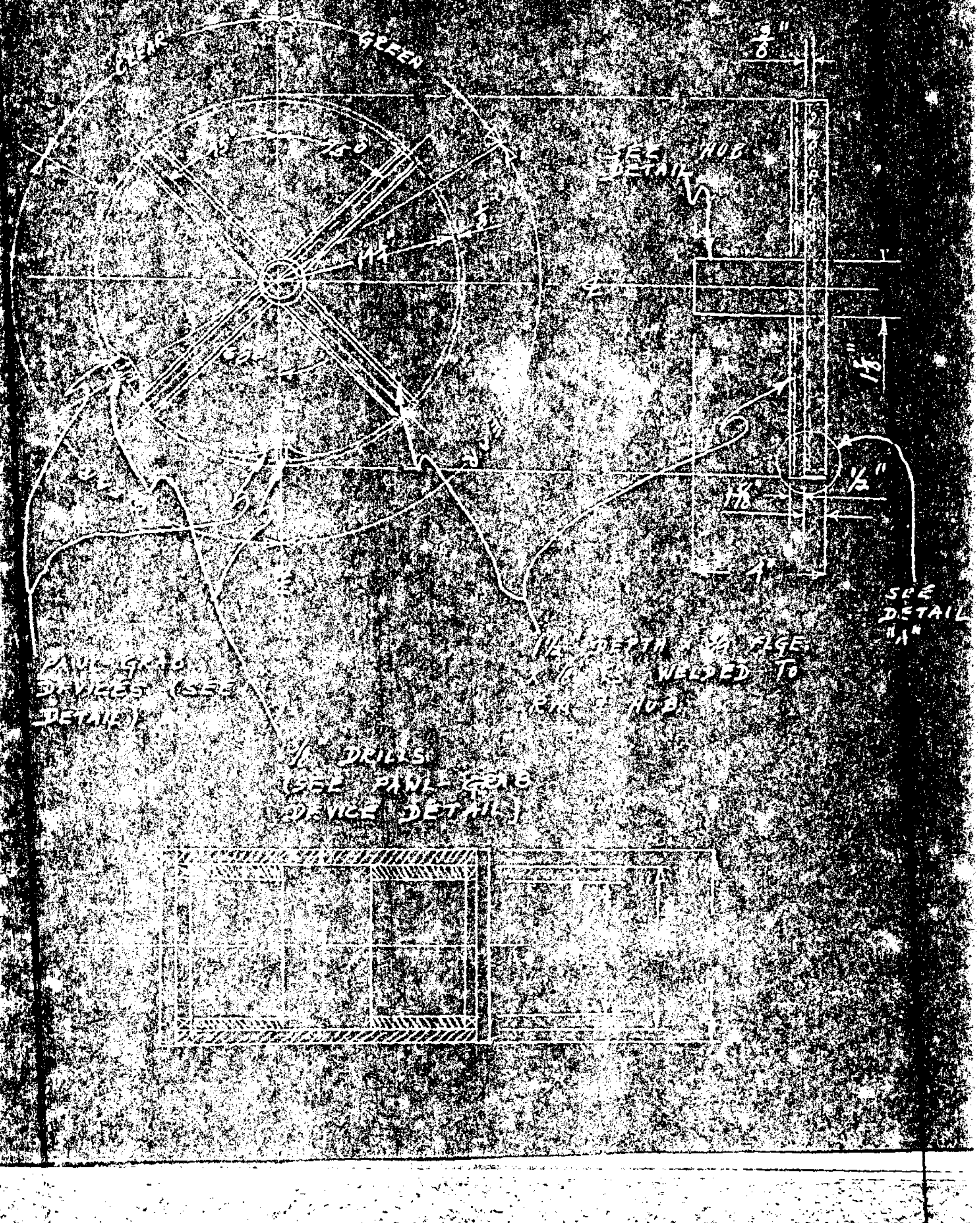
DIAMETRICAL PLASTIC DRUM VIEW

SHT. #1


FILTER SECTION "A"
GRIND ADJOINING EDGES OF LUCITE
SHEETS TO INDICATED BEVEL 45°;
LEAVE GRD EDGES ROUGH, AND
FILL IN WITH DENTAL POLY-METHA
CRYLATE POLYMER PASTE
15°
15°
30°
FILTER SECTION "B"
GRIND, BUFF, & POLISH PERIPHERAL SURFACE OF "WELD"
PREPARATION OF LONGITUDIN
SEAMS BETWEEN FILTER
SECTIONS BOTH DRUMS
6-LUCITE BRG. BLOCKS
LUCITE END
RG. 1/8" THK
1/4 LG. "WEL
TO DRUM INS
6-EQUI-SPACED
RD. HD. MACH. SCREWS
PER SECTOR TO
DRIVEN-END RING
DRIVEN END
FILTER SECTION
FILTER SECTION
FILTER SECTION
14 1/8
O.D.
60°
60°
60°
60°
60°
60°
1/8
3/4
1/4
1/8
18 1/2"
EXTERNAL PROJECTED HEIGHT OF ~~CYLINDER~~ FILTER SECTION
DRUM #2 (SIDE
ELEVATION &
R.H. END VIEWS



HD. MACH SCREWS PER
60° SECTOR TO END-RINGS
FILTER SECTION
FILTER SECTION
FILTER SECTION
PLASTIC
R.H. GUIDE
ASSEMBLIES
DRUM #1 (SIDE ELEVATION & R.H.
END VIEWS)
WELDED
HUB & RIM
FOR
END-RING


CLEAR
GREEN
SEE HUB DETAIL
SEE DETAIL "A"
PAWL GRID DEVICES (SEE DETAIL)
DRILLS (SEE PAWL GRID DEVICE DETAIL)
WELDED TO
HUB

TO JOE F. Re [illegible] JOB

GUARD closely the enclosed papers.

PHOTOSTAT SAME on premises retaining photostat.

MAIL IMMEDIATELY originals to PORT JERVIS, marked personal, att. NORMAN

Give photostatic copy to SIDNEY LIOZ, only.

If he's gone on vacation or is going on vacation & won't work on same until he comes back, then no sense in even giving same to him. But I would like him to put if possible, sufficient time in, in order this gets started.

Push NORMAN to get Patent work started on this p[illegible]

To Joe F. Re "Pryatin" Job

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& won't work on same until he comes back, the[n]
never mind giving same to him. But I would
like him to put, if possible, sufficient time in, in ord[er]
this get started.
Ask NORMAN to get Patent work started on this

FD-141
(1-13-45)

BULKY EXHIBIT

Date received 6/30/51

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained Warden E. E. Thompson

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Ultimate disposition to be made of exhibit Retained

Estimated date of disposition - To be decided at conclusion of case

List of contents:

125. Two letters addressed to

OSCAR THALER,
45 Crosby Street
New York City

73

100-95068-1B

[illegible] Palmer
[illegible] By St
[illegible] 13, N.Y.

[illegible] Palmer
[illegible] Crosby St.
N.Y. 12, N.Y.

Liquidation Sale Satisfies Pathe

CHICAGO, June 24.—"Complete satisfaction" with results of the liquidation sale of 2 million dollars worth of Pathe and Freed-Eisemann television sets and radios was expressed today by Sidney Joffee, Pathe Television Corp., president.

"I'd bring what's left of the stock to the music show, but I don't expect to have much left," Mr. Joffee declared.

M Adds 14-Inch Model at $139.95

CHICAGO, June 18.—John Meck Industries has added a 14-inch picture tube television receiver to retail at $139.95, which was said by John S. Meck, president, to be $20 under the nearest competitive set in the industry.

The new set has a leatherette table-top cabinet similar to the company's earlier model 616T, 16-inch table set, and has a standard chassis with continuous tuner. The model, identified as MM-614-TL, is in production for immediate delivery.

"We are adding this low cost unit as a 'sales starter' for both distributors and retailers," Mr. Meck said.

Majestic Offers Special TV Deal To Retailers

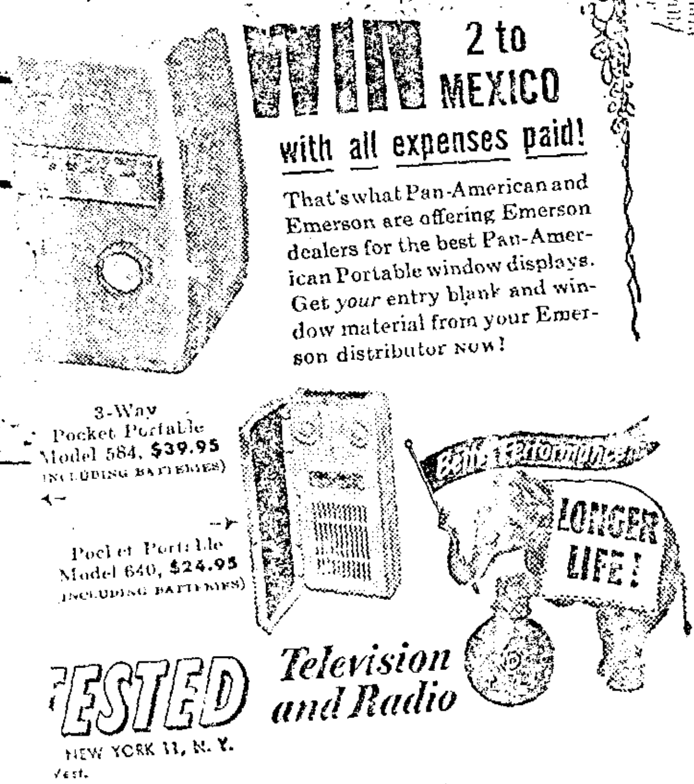
Firm Giving Promotional Allowance on 17-Inch Sets

CHICAGO, June 21.—A new television buy was offered dealers this week by the Majestic Radio & Television division of the Wilcox-Gay Corp. Included in the special deal are a 17 inch leatherette table model and a 17 inch mahogany consolette: both 1951 models. According to Leonard Ashbach, Majestic president, who would not quote list prices of the sets, the dealers pay "regular prices" for the sets but receive a promotional allowance.

Mr. Ashbach reported that 2,000 units of the table model have been sold since the deal was offered Monday and "almost as many" units of the consolette.

The special offer will continue until 5,000 units of each set have been sold.

Lacy's, Washington, D. C., was one of the first takers of the field and Hudson-Ross, Chicago, also bought the sets. Quantities sold to these retailers could not be learned.



[illegible]

P. 1 – 6

11

NORMAN (S. LIPZ) – [illegible] ARTICLE LABELED "CBS-Columbia [illegible] the year" in Retailing 6/27/51 – Paragraph 4: [illegible] the [illegible] very SIMPLY. We have a golden [illegible] Let's push THRU IMMEDIATELY the working sample models.

F.L. (i.e. J.R., J.K., M.K., H.F.) – NOTE ARTICLE labeled "C.B.C. [illegible] President [illegible] to [illegible] this year" in Retailing [illegible] Paragraph #6, first sentence. They say "[illegible] Sales," but the firm will ask distributors [illegible] line promoted by the manufacturer.

MURRAY, S. LIPZ – (re: F.L. only) I can't impress you [illegible] for keeping quiet [illegible] color television [illegible]. I want only the [illegible] engineers who are working [illegible] to [illegible] [illegible] must absolutely know. The only ones [illegible] the [illegible] NORMAN & S. LIPZ. The fact that [illegible] has not kept quiet ([illegible] shooting his mouth off) has [illegible] [illegible] [illegible] & so caused some [illegible] be upset. Henceforth everyone will refer to the subject as the "[illegible] project."

[illegible] – How many of the air conditioning units [illegible] [illegible] [illegible] [illegible] Monthly? [illegible] [illegible] from H. M.? When does [illegible] [illegible]? [illegible] the [illegible] [illegible]? [illegible]. Is NORMAN SHIPPING AIR CONDITIONING units [illegible] WHAT LATEST with MORGENTHAU? Bus[illegible] closing? [illegible] [illegible]? Keeping [illegible] MORT. at [illegible]? [illegible] of [illegible]? How's AARON MACH. Business?

> MAKE sure [illegible] will not try to kill you

F.A. - Confirming previous note, please come on SAT. afternoon (without MOM - TOO MUCH Trouble for h[illegible]) I know you'll be able to get in. Tell them only if you are questioned, that you can't make it during the week.

(& come in with Him)

J.F. - Please Have Spiegel see me as soon as you [illegible]. Has S.E.A.'s sentence been reduced to 9 mo. & 17 days to 8 mo. (8 mo. sentence = 8 Mo. minus 40 DAYS while 9 MO, 17 DAY Sentence = Same minus 1 MO & 17 DAYS a flat 8 mo. - If the former he would get out on July 3rd, if latter by Aug. 11th. Of course, if he gets back the 15 DAYS soon enough, he would get out in either case 15 DAYS earlier.) - What's on Designation VIA L.K.? Did you get a message for N.A.M. on same? - C.F. - to come on any other day but TUES. - LT. LYNNE is on the TUESday — Met the "devil". I understand a Table m[illegible] was delivered to (Home & accompanying to N.A.M) - Re bottom Page 2 - memo - 6/16/51 - I specified all P.L. if you [illegible]. No Bill unless & until I say so. Also I said deliver aerial antenna, but would install himself. Therefore arrange a Set at your convenience. — What's the latest on New [illegible], Army lease at Sonnett, & Teleking. Note that $149.95 air conditioning unit advertised by VIM is only ½ HP & a piece of junk. — You can arrange Installation & Service for customer. ASK NORI.

TO J.E.F.   Re: "[illegible]" JOB

GUARD dearly the enclosed papers.

PHOTOSTAT SAME on your way, retaining photostats.

MAIL IMMEDIATELY originals to PORT JERVIS, marked personal, att. NORMAN

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Ask NORMAN to get Patent work started on this [illegible]

DRUM TYPE COLOR WHEEL FOR BLACK-&-WHITE & COLOR TV

Let us consider a drum composed of 6-slats (2 series of the prim
and let us assume that this drum will be used for a 20" p
as we will assume

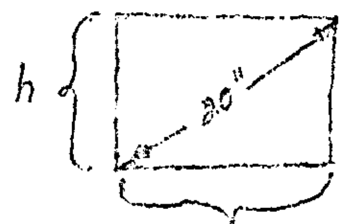


FIG. I

$$1.25h = l$$

then

$$(1.25h)^2 + h^2 = 20^2$$

$$h^2 = \frac{400}{2.56} = 156.2$$

$$h = 12.5''$$

$$l = 1.25(12.5) = 15.6''$$

would be the dimensions of the tube. For each slat to "cover", the pi
would be necessary that

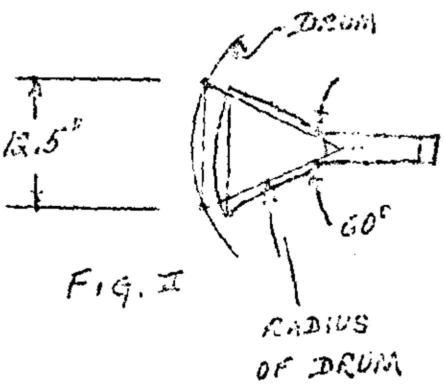


FIG. II

$$\frac{\frac{12.5}{2}}{\sin\frac{60}{2}} = \frac{6.25}{2} = 12.5'' = r$$

of the Drum.

Let us now suppose the drum is formed a
section shown in Fig. 3, in which the slats
curved members "fitting" into a retainer rin
These slats were to consist of 1/16" thk. of ...
sheet, and their length were to be 17", then
each would have a volume of

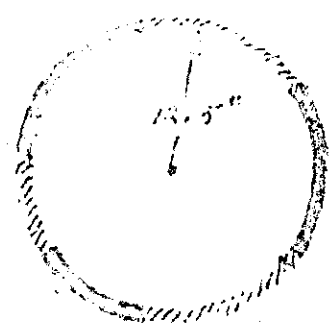


FIG. 3

$$2\pi r l \left[\frac{60}{360}\right] t = \frac{2\pi(12.5)(17)(60)\frac{1}{16}}{360}$$

$$13.9 \text{ in.}^3$$

and a specific gravity of 1.18, then

$$\frac{62.5 \frac{lb}{ft.^3}}{1728 \frac{in.^3}{ft.^3}} \cdot 1.18 \cdot 13.9 \text{ in}^3 = 0.59$$

would be the weight of each slat, where:-
62.5 lb/ft.^3 is taken as the density of w

In the standard CBS color disc, 9 discs (3 series of the primary three) ar
at 1440 rpm. This would set a speed of

$$\frac{9}{6}(1440) = 2160 \text{ rpm for the 6-slot drum}$$

This would mean an angular velocity of

$$\frac{1440 \frac{revs.}{min.} \left(2\pi \frac{rad.}{rev.}\right)}{60 \frac{secs.}{min.}} = 150.8 \frac{rads.}{sec.}$$

The centrifugal force acting on each slot would then be:-

$$F_c = \frac{W}{g} w^2 r$$

$$= \frac{0.594 \text{ lb.}}{32 \frac{ft.}{sec.^2}} \cdot \left[150.8 \frac{rad.}{sec}\right]^2 \frac{12.5 \text{ ins}}{12 \frac{ins.}{ft.}}$$

$$= 440 \#$$

and both retainer rings could therefore be said to acting under a l

$$440 \frac{\#}{slot} (6 \text{ slots}) = 2640 \#$$

together, and

$$\frac{2640 \#}{2 \text{ retain rings}} = 1320 \frac{\#}{ring}$$

To hold the tensile stress in each ring to 1/5 of an assumed ulti value of 71,000 #/in.² with a 3/4" wide ring would require a

$$\frac{1320 \#}{0.75 \text{ ins.} (t)} = 14,000 \frac{\#}{in.^2}$$

$$\frac{1320 \#}{0.75 \text{ ins.} (14,000 \#/in.^2)} = 0.1258'' = t$$

[illegible] the slot must also be reviewed as a uniformly loac [illegible] which is simply supported at each end:-

$$M = \frac{wx}{2}(l - x) = EI\left(\frac{d^2y}{dx^2}\right)$$

$W = wl$

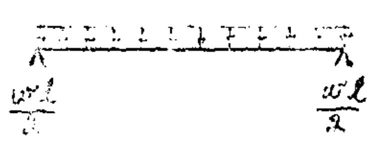


Fig. IV

$$\frac{w}{2}(lx - x^2) = EI\left(\frac{d^2y}{dx^2}\right)$$

$$\frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3}\right) + C_1 = \frac{dy}{dx}$$

But $\frac{dy}{dx} = 0$, when $x = \frac{l}{2}$, and so:-

$$\frac{w}{2EI}\left(\frac{l^3}{8} - \frac{l^3}{24}\right) + C_1 = 0$$

$$C_1 = -\frac{w}{2EI}\left(\frac{l^3}{12}\right) = -\frac{wl^3}{24EI}$$

[illegible]

$$\frac{dy}{dx} = \frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3}\right) - \frac{wl^3}{24EI}$$

$$y = \frac{w}{2EI}\left(\frac{l x^3}{6} - \frac{x^4}{12}\right) - \frac{w l^3 x}{24EI} + C_2$$

But, since $y = 0$ when $x = 0$, then

$$C_2 = 0$$

and

$$y = \frac{w}{2EI}\left(\frac{l x^3}{6} - \frac{x^4}{12} - \frac{l^3 x}{12}\right)$$

At $x = \frac{l}{2}$, it is clear that (y) would have its maximum value; $(y)_{max.}$ would be given by:-

$$y_{max.} = \frac{w}{2EI}\left(\frac{l^4}{48} - \frac{l^4}{192} - \frac{l^4}{24}\right)$$

$$= -\frac{5 w l^4}{384 EI} = -\frac{5 W l^3}{384 EI}$$

This gives us a form for computing the deflection, and the stresses, in the ... when the rotors are up to full design speed. It is now necessary to ... the value of (I) for the slats.

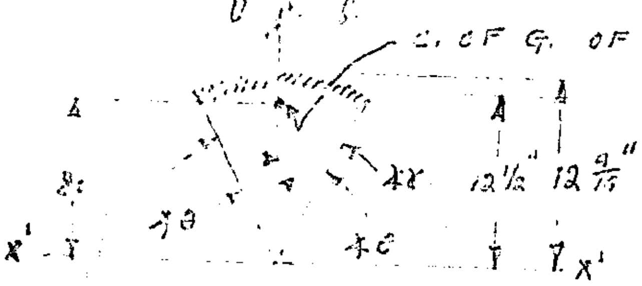


Fig. V

y'

It is clear that the mean radius ... $r = 12\frac{1}{2}''$ and $r'' = 12\frac{9}{16}''$ (which ... is $12\frac{17}{32}''$) would be the radius of gyration of the slat indicated in ... with respect to the axis $x'x'$. Then since the cross-sectional area ... slat is approximately

$$\frac{t(2\pi r_{mean})\,4r}{360} =$$

$$\frac{\frac{1}{16}(2\pi)(12\tfrac{17}{32})(60)}{360} = 0.822$$

the (I) with respect to the $x'x'$ ... would be

$$Ah^2 = 0.822\left(12\tfrac{17}{32}\right)^2 = 129 \text{ in.}^4$$

The center of gravity of the slat would be given by:-

$$y_0 = \frac{r_{mean} \sin\theta}{\text{rad. }\theta}$$

$$= \frac{(12\tfrac{17}{32})(\sin 30°)}{\text{rad. } 30°} = \frac{12\tfrac{17}{32}''\,(0.5)}{0.5236} = \ldots$$

If (I_0) is the moment of inertia of the slab's section about its own [illegible] of gravity, then

$$I_{x'x'} = I_0 + A y_c^2$$

and so

$$129 \text{ in.}^4 = I_0 + 0.822(11.95)^2$$

$$129 - 0.822(142.5) = 129 - 117.5 = 11.5 \text{ in.}^4$$

From this, it follows that

$$y_{max} = -\frac{5Wl^3}{384EI} = -\frac{5(440)(17)^3}{384(2)(10^6)(11.5)} = 0.000122 \text{ ins.}$$

which is acceptable if it does not involve an excessive stress.

$$y_{max} = \frac{5Wl^3}{384EI} =$$

and

$$M_{max} = \frac{wl^2}{8} = \frac{Wl}{8}$$

Therefore

$$y_{max} = \frac{Wl}{8} \cdot \frac{5l^2}{48EI} = \frac{5Ml^2}{48EI}$$

But

$$M = SZ$$

where

M = Moment induced in the beam — in-lbs.
Z = Sectional modulus of the beam — in.^{3}
S = stress induced in the beam — #/in.^{2}

and

$$\frac{I}{c} = Z$$

where

c = distance of the extreme fibre from the neutral axis of the beam

and hence

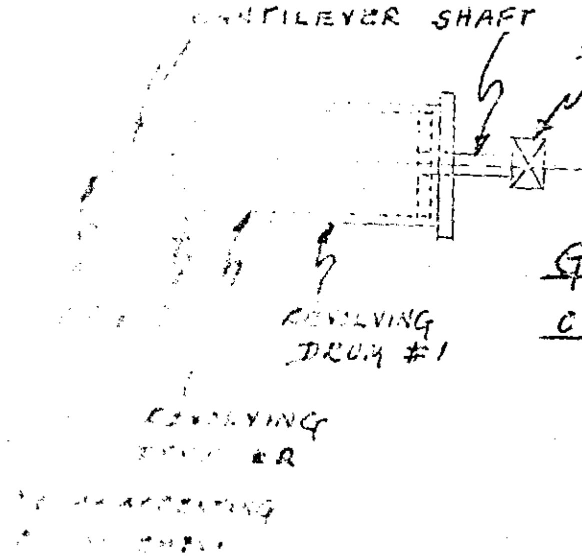
$$y_{max} = \frac{5(S)\left(\frac{I}{c}\right)l^2}{48EI} = \frac{5S\cancel{I}l^2}{48E\cancel{I}c}$$

By this equation,

$$0.000122 \text{ ins.} = \frac{5\left(12\tfrac{7}{32} - 11.5\right)(17^2)S}{48(2)(10^6)} = \frac{5(\cancel{0.732})(17^2)}{96(10^6)(1.}$$

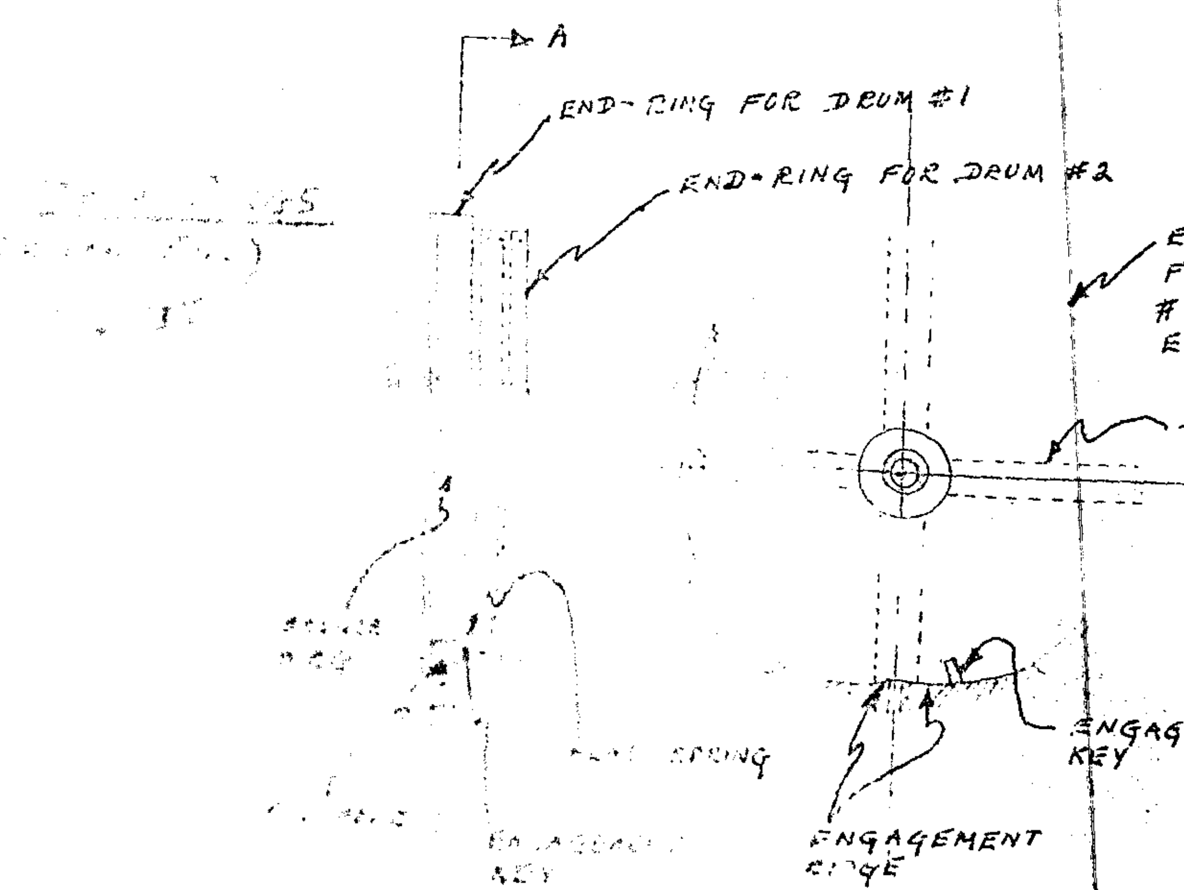
$$\frac{0.732(0.000122)(96)(10^6)}{5(\cancel{0.732})(289)} = S = 8.38\ \cancel{.8?7}\ \#/\text{in.}^2$$

NOTE:- DRUM #2
CONSIST OF 5 CO
FILTERS, AND 1 W
LIGHT SLAT; DRU
5 WHITE LIGHT SL
1 COLOR SLAT COM
2 SERIES FOR DR



GENERAL ARRANGEMENT OF DRUM SUPPORT

FIG. VI



SECTION A-A

FIG. VIII

To approximate the combined weights of the Drums, let us proceed as follows:

12 slats – 17" long,

$$\frac{2\pi r\,60}{360} = \frac{2\pi\,(12.5)(60)}{360} = 13.1\text{" wide}$$

and $\frac{1}{16}$" thick

would weigh

$$\frac{12(17)(13.1)(0.0625)(62.5)(1.18)}{1728} = 7.17\#$$

and, if we estimate each end-ring at 3#, then the drum rings would weigh 12# in total, to give a total weight of approximately 20#. This could be said to have a radius of gyration of approximately 13", giving the Drum a $\Sigma m r^2$ of:

$$\Sigma m r^2 = 20\left(\frac{13}{12}\right)^2 = 23.5 \text{ lb-ft.}^2$$

For such a drum to attain a velocity of 150.8 $\frac{\text{rads.}}{\text{sec.}}$,

$$\frac{23.5}{2(32)}(150.8)^2 = \frac{16,700}{2} \text{ ft.-lbs.} = 8,350 \text{ ft.-lbs.}$$

of energy is required in the form of flywheel energy. Quite evidently, this would require a large motor and it would be desirable to reduce this requirement to a fraction of the indicated figure. Let us therefore reduce the weight of the drum, making particularly the weight at the indicated radius of gyration a 3# limit for the 4 end-rings in total. In that case,

$$\frac{10.17}{2(32)}(\ldots) = \frac{7240}{2} \text{ ft-lbs.} = 3620 \text{ ft.-lbs.}$$

would be the required flywheel energy, and if this were supplied in a

$$\frac{\cancel{7240}\ 3620 \text{ ft.-lbs.}}{(60 \text{ sec.})(550 \ldots)} = 0.\cancel{210}\ 105 \text{ HP}$$

motor would be required.

In bringing the Drum back to a stop, let us assume that 30 sec. is stipulated. Then the negative acceleration of

$$\alpha = \frac{\Delta\omega}{t} = \frac{2(150.8-0)}{60} = 5.03 \frac{\text{rads.}}{\text{secs.}^2}$$

is entailed, and the torque-rating of the brake would have to be

$$\frac{10.17}{32}(5.03) = \cancel{593.15}\ 1.595 \text{ ft.-lbs.}$$

Were this to be applied via a mechanical brake, this would mean, applied on a 13" radius, a

$$\frac{15.95 \text{ ft-lbs.} \left(12 \frac{\text{ins.}}{\text{ft.}}\right)}{(13 \text{ ins.})} = 14.7\#$$

braking-force. If an eddy-current brake were to be used, it would to be one in which a

$$\frac{\overset{3620}{\cancel{17170}} (\text{ft-lbs.})}{60 \text{ (sec.)}} = \overset{60.3}{\cancel{286.3}} \frac{\text{ft-lbs.}}{\text{sec.}}$$

energy consumption is planned. The theoretical electrical rating of the e would then have to be:

$$\frac{\overset{60.3}{\cancel{286.3}} \frac{\text{ft.-lbs.}}{\text{sec.}} \left(0.746 \frac{\text{kilowatts}}{\text{H.P.}}\right)}{550 \frac{\text{ft-lbs.}}{\text{sec.-HP}}} = \overset{0.0825}{\cancel{0.389}} \text{ KW}$$

but because eddy current brakes are quite inefficient, the actu brake rating would have to be substantially larger. A mechanical brak applied to the output shaft of the driving motor also deserves consi

The question arises of applying the braking force until a minimum speed is attained, and then leaving it to the positio pin to bring the drum down to a full-stop for the combined posit and disengagement of the drum from Drum #2. Assume the use a ¼" diameter round pin with a cantilever length of 2". By formulas (for cantilever beams)

$$M = Pl = SZ = S\frac{I}{c}$$

$$f = \frac{Pl^3}{3EI}$$

we derive

$$f = \frac{Sl^2}{3Ec}$$

Using this formula, we see that for a stress limit which is ta 75% of the elastic limit, and taking the elastic limit to be 30 #/in.², then for a material for which $E = 26(10^6)$

$$f = \frac{0.75\left(30,000 \frac{\#}{\text{in.}^2}\right)(2 \text{ ins.})^2}{3\left(26 \times 10^6 \frac{\#}{\text{in.}^2}\right)\left(\frac{\frac{1}{4}}{2} \text{ ins.}\right)} = 0.00924 \text{ ins.}$$

Quite obviously, the pin would be working as a spring storing up e and so, if (K) represents the force stored in the spring per inc deflection, then

$$W \text{ (work stored in the spring)} = \int_{y=0}^{y=y} Ky = \frac{K}{2} y^2$$

where y = the limiting deflection of the spring. Thus, if we re-arrange equation

$$f = \frac{Pl^3}{3EI}$$

[illegible] from

$$\frac{3EI}{l^3} = \frac{P}{f} = K = \frac{3\pi E d^4}{l^3}$$

we find that

$$K = \frac{3\pi\,(126 \times 10^6\ \#/in.^2)(1/4)^4}{2^3} = 119{,}500\ \#/in.$$

[illegible] of this, the work stored by a deflection of 0.00924" would be

$$\frac{1}{2}\left(119{,}500\ \#/in\right)(0.00924)^2 = 5.08\ in\text{-}lbs.$$

[illegible]

$$\frac{5.08\ in\text{-}lbs.}{12\ \frac{ins.}{ft.}} = 0.423\ ft\text{-}lbs.$$

of energy. This would limit the velocity of the drum to

$$0.423 = \frac{10.17}{2(32)}\omega^2$$

$$\left[\frac{[illegible]}{10.17}\right]^{1/2} = \omega = \left[2.75\right]^{1/2} = 1.66\ rads./sec.$$

[illegible] positioning pin in sent "home". This would mean that the [illegible] of [illegible] would be to reduce the Drum [illegible] speed from 150.8 r[illegible] [illegible] rads./sec., after which the pin would take care of [illegible] [illegible] the Drum [illegible] to a full stop.

[illegible] the use of a ½ horsepower motor drive and assume [illegible] before Drum #2 is properly positioned for black-and-w[illegible] [illegible], we [illegible] now proceed to the design of the second positioning [illegible]

The velocity of the Drum #2 assembly at the end of the above-mentioned 120 [illegible] can be arrived at by applying the ratio of: the specified motor to the computed required motor, to the acceleration on which the computed [illegible] is based. Thus, the computed required motor would raise the speed of the Drum Assembly from zero to 156.8 radians/sec. in 60 secs., or [illegible] acceleration of

$$156.8 = \frac{1}{2} a (60)$$

$$\frac{2(156.8)}{60} = 5.63 \text{ rads./sec.}^2$$

Using a 0.125 HP motor in the place of the 0.115 HP computed requirement [illegible] may take

$$\frac{(0.125 \text{ HP})}{(0.115 \text{ HP})} \left[5.63 \text{ rads./sec.}^2 \right] = 5.98 \text{ rads./sec.}^2$$

[illegible] the acceleration which the specified motor would apply. The 120° [illegible] of [illegible] constitutes a travel of

$$\frac{120}{360}(2\pi) = \frac{2}{3}\pi \text{ radians}$$

The above-given acceleration of 5.98 rads./secs. would be applied to an assembly with a Σmr^2 of 10.7 lb.-ft.^{2}, while in the motor [illegible] [illegible] Drum alone roughly one-half of this Σmr^2 is involved; [illegible] the acceleration of the #2 Drum (assuming the same motor [illegible]) would be

$$2(5.98) = 11.96 \text{ rads./sec.}^2$$

$$s = \frac{1}{2} a t^2$$

$$\frac{2}{3}\pi = \frac{1}{2}(11.96)(t^2)$$

$$t = \left[\frac{2(2\pi)}{3(11.96)}\right]^{1/2} = 0.35^{1/2} = 0.592 \text{ secs}$$

[illegible] required to move thru the mentioned arc; and

$$[illegible] = \frac{1}{2}(11.96)(0.592) = 3.54 \text{ rads./sec.}$$

[illegible] at the conclusion of the arc of travel. The [illegible] positions Drum [illegible] may be changed. These two criteria [illegible] of the two functions which the latch serves:- (1) firstly, it serves to stop and position Drum #2 with respect to Drum #1 when black-and-white viewing is intended; and (2) it is the means by Drum #1 is motivated along with Drum #2 in color-viewing. In stopping Drum #2 after ~~it has~~ Drum #1 has already been positioned, it must absorb the flywheel energy of Drum #2. This would mean, since Σmr^2 for each Drum has been taken at 5.085 lb.-ft.^{2}, that

$$\frac{(5.055 \text{ lb.-ft.}^2)}{(2)(32 \frac{\text{ft.}}{\text{sec.}^2})}(3.54 \text{ rads./sec.}) = 0.382 \text{ ft-lbs.}$$

of energy would have to be absorbed. By reference to the previous calculations concerning the pin which positions Drum #1, it is clear that a member with a sectional modulus equal to a 1/4" ⌀ round would more than suffice for this service, if it were no longer than the aforementioned pin. According to the second criterion for the design of the latch member, it would be required at a maximum to transmit a torque equal to

$$\frac{(10.17 \text{ lb.-ft.}^2)}{(32 \text{ ft./sec.}^2)}[5.89 \text{ rads./sec.}^2] = 1.871 \text{ ft-lb.}$$

or

$$(1.871 \text{ ft.-lb.})(12 \frac{\text{ins.}}{\text{ft.}}) = 22.45 \text{ in-lbs.}$$

~~at a design stress limit of~~ Since the latch is located on about a 13" radius from the axis of rotation, the torque indicated above implies a load of

$$\frac{22.45 \text{ in-lbs.}}{13 \text{ ins.}} = 1.728\#$$

applied to the end of the latch. Were the latch 2" lg., this would mean the inducing of a bending load of

$$1.728(2) = 3.456 \text{ in-lbs.}$$

which is, in fact, insignificant, and worthy of no further computations.

This brings us to the question of the shafting by which the Drums are motivated. On reconsideration of the loads involved, it is practical, from a superficial observation, to think in terms of a cantilever shafting mounting of the Drums from one end as per the figure below:-

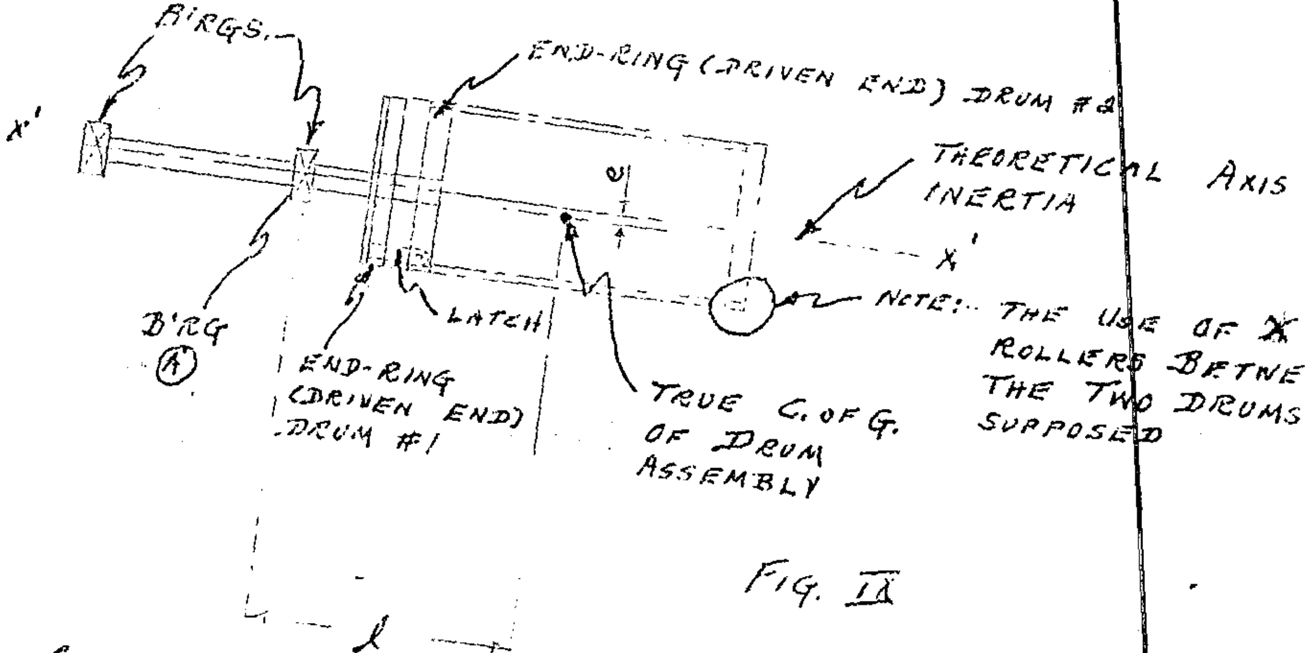


FIG. IX

As portrayed above, the double-drum assembly is considered as a single concentrated load on a cantilever shaft, with the length of the shaft being taken as equal to the longitudinal span between Brg. (A) and the True Center of Gravity of the combined drum assembly. The use of spacer-rollers as indicated contributes towards the validity of this viewpoint.

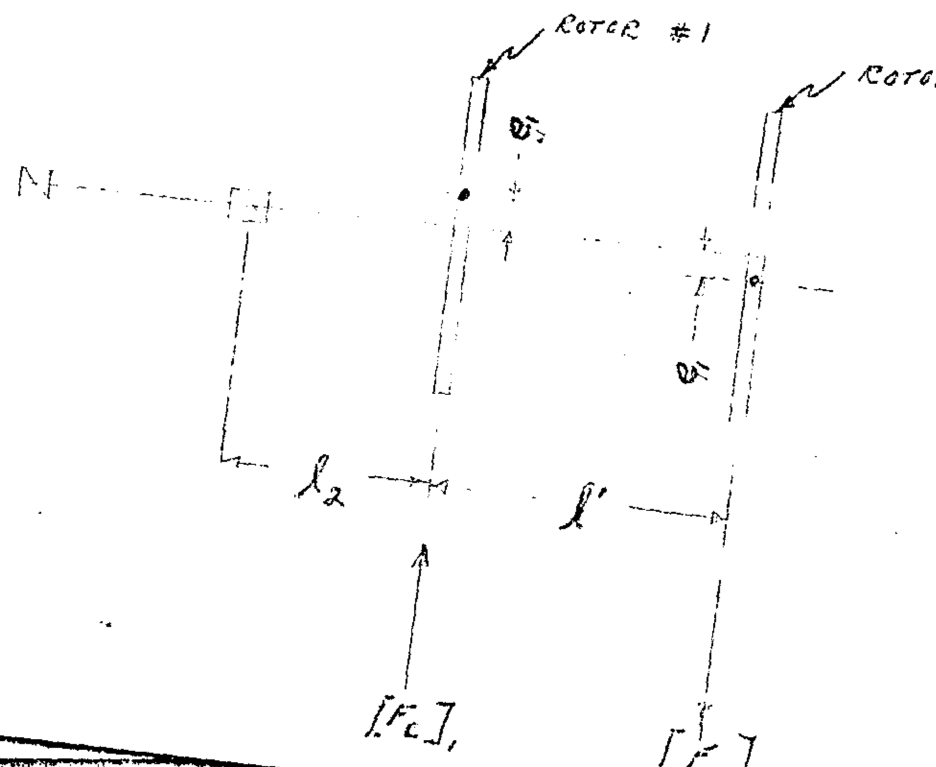
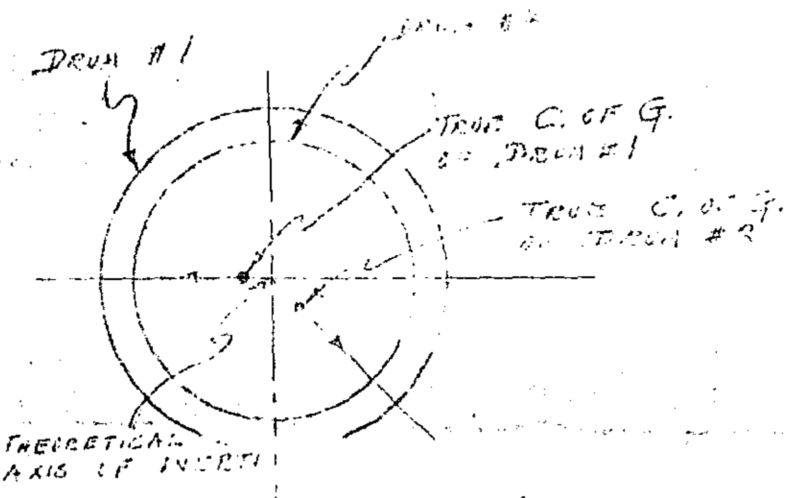


FIG. 10



SCHEMATIC END VIEW OF ASSEMBLY (DRUMS)

FIG. XI

The [illegible] taken above is, fundamentally, a simplified and idealized one. [illegible] in opposition to the [illegible] [illegible] shaft, to carry [illegible] concentrated loads. [illegible] the shaft [illegible] carrying two [illegible] concentrated loads, there is [illegible] possibilities (assuming that each drum has been fabricated to identical tolerances as to balance). These possibilities are illustrated in Figs. 10 [illegible]

[illegible] the situation in which [illegible] of identical weight [illegible] eccentrically-opposite [illegible] that are mounted on the same shaft;

and,

b. Fig. XI illustrates the situation [illegible] two rotors of identical weight have their identical eccentricities acting in different axial planes.

Analyzing the situation [illegible] by Fig. X, it is clear that since the eccentricities of [illegible] are identical, each [illegible] — to begin with — exert a centrifugal force on the shaft, as given by:—

$$\frac{W}{g} \ldots$$

But [illegible] (ℓ_1) [illegible] (ℓ_2) [illegible] [illegible] rotational moment [illegible] eccentrically opposite [illegible] (or rotational couple) of magnitude

$$\frac{W}{g} \ldots e\,\ell$$

For as long as [illegible] rotational couple [illegible] [illegible] left of ($\ell_3 + \ell/2$) to an [illegible] of the shaft ~~[illegible]~~ [illegible] and any section to the right of ($\ell_3 + \ell/2$) to a [illegible] rotation. Such [illegible] the mentioned portion of the span would present [illegible] different reactions to the couple, and would consequently result in

... from the centroid axis of inertia of different ... would ... would be destroying ... shown pictorially below:

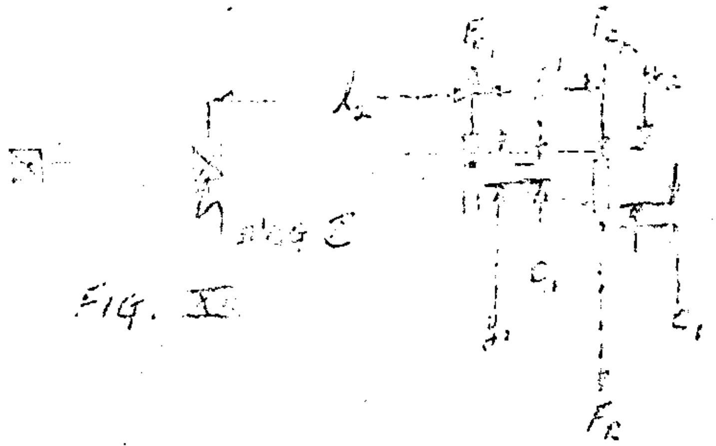


FIG. X

... a situation in which the forces (F_{c_1}) and (F_2) ...

$$\frac{(F_{c_2})(l'+l_2)-(F_{c_1})l_2}{(l_2+l')}=F_R$$

... force (F_R) acting at a lever arm of (l_2+l') ... moment acting on any section of the beam would ...

$$(\ldots - x) = EI\frac{d^2y}{dx^2}$$

... would take the form

$$y=-\frac{F_R}{EI}\left(\frac{[l'+l_2]x^2}{2}-\frac{x^3}{6}\right)$$

..., a K-value

[illegible]

and

$$F_{c_2} = \frac{W}{g}(y_2 + e_1)\,\omega^2$$

Moreover, since

$$F_{c_2} + F_{c_1} = K y_2$$

we may write

$$\frac{W}{g}(y_1 - e_1)\,\omega^2 + \frac{W}{g}(e_1 + y_2)\,\omega^2 = K y_2$$

[illegible]

$$\omega^2 (y_1 + y_2) = \frac{Kg}{W} y_2$$

$$\frac{\omega^2 y_1}{\frac{Kg}{W} - \omega^2} = y_2 = \frac{y_1}{\frac{\left(\frac{Kg}{W}\right)}{\omega^2} - 1}$$

[illegible] of the final equation [illegible]

1) as (ω^2) approaches $\left(\frac{Kg}{W}\right)$ in value, (y_2) would attain extremely large values, becoming infinite when $\omega^2 = \frac{Kg}{W}$ (i.e. [illegible]).

2) since (y_2) is expressed in terms of (y_1) with $\left[\frac{Kg}{W\omega^2} - 1\right]^{-1}$ as a multiplier of (y_1), it is clear that when $\omega^2 < \left(\frac{Kg}{W\omega^2}\right.$ [illegible] approaches [illegible] in magnitude, then the portion of the shaft beneath Rotor #1 is the critical section; while, [illegible] becomes

$$y_2 = \frac{y_1}{1 - \frac{Kg}{W\omega^2}}$$

means that the [illegible] of the shaft above Rotor #2 [illegible] critical [illegible]

[illegible] Fig. 11 [illegible] of analyzing [illegible] do two [illegible] designated load [illegible] supporting the two [illegible] around the [illegible] (y_2) is [illegible] the [illegible] and [illegible] the dynamic [illegible]

[illegible] by the normal static [illegible] from the dynamic [illegible] any attempt to [illegible] between (y_1) and (y_2) [illegible] and, in fact, [illegible] the first [illegible] resonance speed. [illegible] concentration [illegible] as established "[illegible]" equation.

[illegible] II, [illegible]

$W = $ [illegible]

$l = $ [illegible]"

$S = $ [illegible] #/in.^{2}

$\omega = $ [illegible].8 [illegible]/sec

$E = $ [illegible] the outer diameter of [illegible] $= 0.005($[illegible]$) = 0.1$[illegible]

$\frac{g}{?} = \left[3 \cdot \frac{[illegible]}{[illegible]} \right] \left[\frac{[illegible]}{[illegible]} \right] = 384$ in./sec.^{2}

$E_T = 25(10^6)$ [illegible]

[illegible] (47) of "[illegible]",

$\frac{[illegible]}{[illegible]} - E\,l - \frac{[illegible]\,S\,l^2}{3 E_T} = 0$

[illegible] $\frac{[illegible](13,[illegible])(1[illegible])^2}{[illegible](10^6)} = 0$

[illegible]

[illegible] $= 0.0$; $A = +0.$[illegible]

$B = $ [illegible]

$C = -0.$[illegible]

$D = -0.$[illegible]

[illegible] $+ C^2 -$ [illegible] $= 0 + 0.01 - 0 + 0 = 0.04$

$k = \frac{4}{3} [illegible] - B^2 - \frac{1}{3} [illegible] = 0 - 0 + \frac{0.43}{3} = 0.143$

$l = \frac{1}{2}\left[h + (h^2 + k^3)^{1/2}\right]^{1/3} + \left[h - (h^2 + k^3)^{1/2}\right]^{1/3} =$

$\frac{1}{2}\left[0.04 + (.0016 + 0.0029)^{1/2}\right] + \frac{1}{2}\left[0.04 -\right.$

$\left.(0.0016 - 0.0029)^{1/2}\right] =$

$\frac{1}{2}[0.04 + 0.164] + \frac{1}{2}[0.04 + 0.108] =$

$0.102 + 0.074 = 0.176$

$u = g + l = 0 + 0.176 = 0.176$

$v = R_y + l = 0 + 0.176 = 0.176$

$w = 4u^2 + 3k - 12gl = 4(0.176)^2 + 3(0.143) - 12(0) =$

$= 4(0.031) + 0.429 = 0.124 + 0.429 = 0.573$

Now, the four roots would be:

$d_1 = -A + u^{1/2} + (v + w^{1/2})^{1/2}$

$d_2 = -A - u^{1/2} + (v - w^{1/2})^{1/2}$

$d_3 = -A + u^{1/2} - (v + w^{1/2})^{1/2}$

$d_4 = -A - u^{1/2} - (v - w^{1/2})^{1/2}$

[illegible]

$d_1 = -0 + 0.176^{1/2} + (0.176 + 0.573^{1/2})^{1/2} = 0.42 + (0.176 + 0.$

$= [illegible] = 1.386''$

[illegible] in the realm of [illegible] values [illegible]

$d^4 - 0.8d - 0.43 = 0$

~~[illegible]~~

$[illegible] = 0$

$[illegible] = 0$

[illegible] value [illegible] (l) as follows

$l = \frac{1}{2}\left[h + (h^2 + k^3)^{1/2}\right] + \frac{1}{2}\left[h - (h^2 + k^3)^{1/2}\right] =$

$\frac{1}{2}[0.04 + .164 + \frac{1}{2}([illegible])] =$

$$= \tfrac{1}{2}\left[0.204 - \tfrac{1}{2}(0.124)\right] = \left[0.204 - 0.062\right]\tfrac{1}{2} =$$

$$\tfrac{1}{2}\left[0.142\right] = 0.071$$

$\therefore$

$$u = 0.071$$
$$v = 0.071$$
$$w = 4(0.071)^2 + 0.43 = 4(0.005) + 0.43 =$$
$$0.02 + 0.43 = 0.45$$

$$d_1 = 0.071^{1/2} + (0.071 + 0.45^{1/2})^{1/2} = 0.276 + (0.071 + 0.[illegible]$$
$$= 0.276 + 0.741^{1/2} = 0.276 + 0.86 = 1.136''$$

Checking,

$$d^2 - 0.8d - 0.43 = 0$$
$$1.66 - 0.8(1.136) - 0.43 = 0$$
$$1.66 - 0.9088 - 0.43 \neq 0$$

Again, using

$$u = \tfrac{1}{2}\left[h + (h^2 + k^3)^{1/3}\right] + \tfrac{1}{2}\left[h - (h^2 + k^3)^{1/3}\right] =$$
$$\tfrac{1}{2}\left[0.204\right] + \tfrac{1}{2}\left[-0.124\right] = 0.102 - 0.062 = 0.04$$

$\therefore$

$$u = 0.04$$
$$v = 0.04$$
$$w = 4(0.04)^2 + 0.43 = 4(0.0016) + 0.43 =$$
$$0.0056 + 0.43 = 0.4356$$

$$d = [illegible] + ([illegible] + 0.4356^{1/2})^{1/2} =$$
$$0.2 + (0.04 + 0.[illegible])^{1/2} = 0.2 + 0.7^{1/2} =$$
$$0.2 + 0.835 = 1.035''$$

Check,

$$d^2 - 0.8d - 0.43 = 0$$
$$1.07 - 0.8(1.035) - 0.43 = 0$$
$$1.07 - 0.828 - 0.43 = 0$$

[illegible] slide-rule accura[illegible] [illegible] 1⅛'' & [illegible] design factors chec[illegible] [illegible]

[illegible] [illegible] the torque in accelerating the drum [illegible] [illegible] [illegible] [illegible] [illegible] of the "shock-torque" to be 1.5 times this value, according to eq. [illegible] of "Shifting from a Dynamic Viewpoint";

$$[illegible] \left[\frac{M_0}{q} \right]^{1/3} = [illegible] \left[\frac{[illegible](1.5)}{[illegible]} \right]^{1/3} =$$

$$0.227 \left[\frac{33.475}{12} \right] [illegible] = 0.227(2.415) = 0.321'' \text{ d}$$

shaft would be required to yield not more than a 1°/20 [illegible] [illegible] [illegible] [illegible]. [illegible], [illegible] [illegible], by eq. 58 of "Shifting From a Dynamic Standpoint";

$$\frac{16 M_t}{\pi d^3} = S_s$$

if again we let M_t = [illegible] "shock torque" and $d = 1.125''$ (as previously suggested)

$$\frac{16(1.5)(22.45)}{\pi(1.125)^3} = \frac{[illegible](22.45)}{\pi(1.42)} = 121 \ \#/\text{in.}^2$$

would be the shear-stress due to torsion. The combined stress due to torsion and bending would then be:—

$$\left[15000^2 + 121^2\right]^{1/2} = \left[2.25(10^8) + 1.41(10^4)\right]^{1/2} \doteq$$

$$15000 \ \#/\text{in.}^2$$

and since a 1⅛" diameter shaft satisfies the principle [illegible] [illegible] [illegible] [illegible] value of [illegible] speed is [illegible] [illegible] [illegible] [illegible] [illegible] given by $\left[\frac{Kg}{W}\right]^{1/2}$ according to eq. [illegible] of "Shifting from a Dynamic Viewpoint". Since

$$K = \frac{[illegible]EI}{l^3} = \frac{[illegible](10^6)(\pi)(1.125)^4}{[illegible](14)} =$$

$$\frac{[illegible](10^6)(\pi)(1.6[illegible])}{64(2750)} = [illegible]$$

[illegible]

$$\left[\frac{Kg}{W}\right]^{1/2} = \left[\frac{[illegible]}{[illegible]}\right]^{1/2} = \left[[illegible]3560[illegible]\right]^{1/2} = 914.$$

per.

$$y = \frac{e}{\frac{\ }{\omega^2} - 1}$$

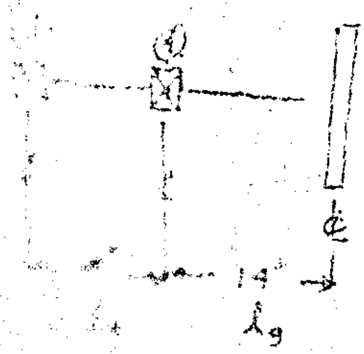
... per Eq. (10) of "Shafting from Clipper ... report",

$$y = \frac{e}{\left(\frac{\ }{\ }\right)^2 - 1} = \frac{e}{\ } = \frac{e}{35.8}$$

... e = 0.14", then

$$y = \frac{\ }{35.8} = .00391"$$

... as to the question of the bearings and spacings: - Assume ... (centerline distance) between ... bearings:



The computed shafting requirement, at ... of 15,000 psi, was 1.035". The ... a shaft would withstand a given ... would be:-

$M = SZ = S\pi d^3/32 =$

$$\frac{15,000\pi(1.035)^3}{32} = \frac{15000(\pi)(1.12)}{32} =$$

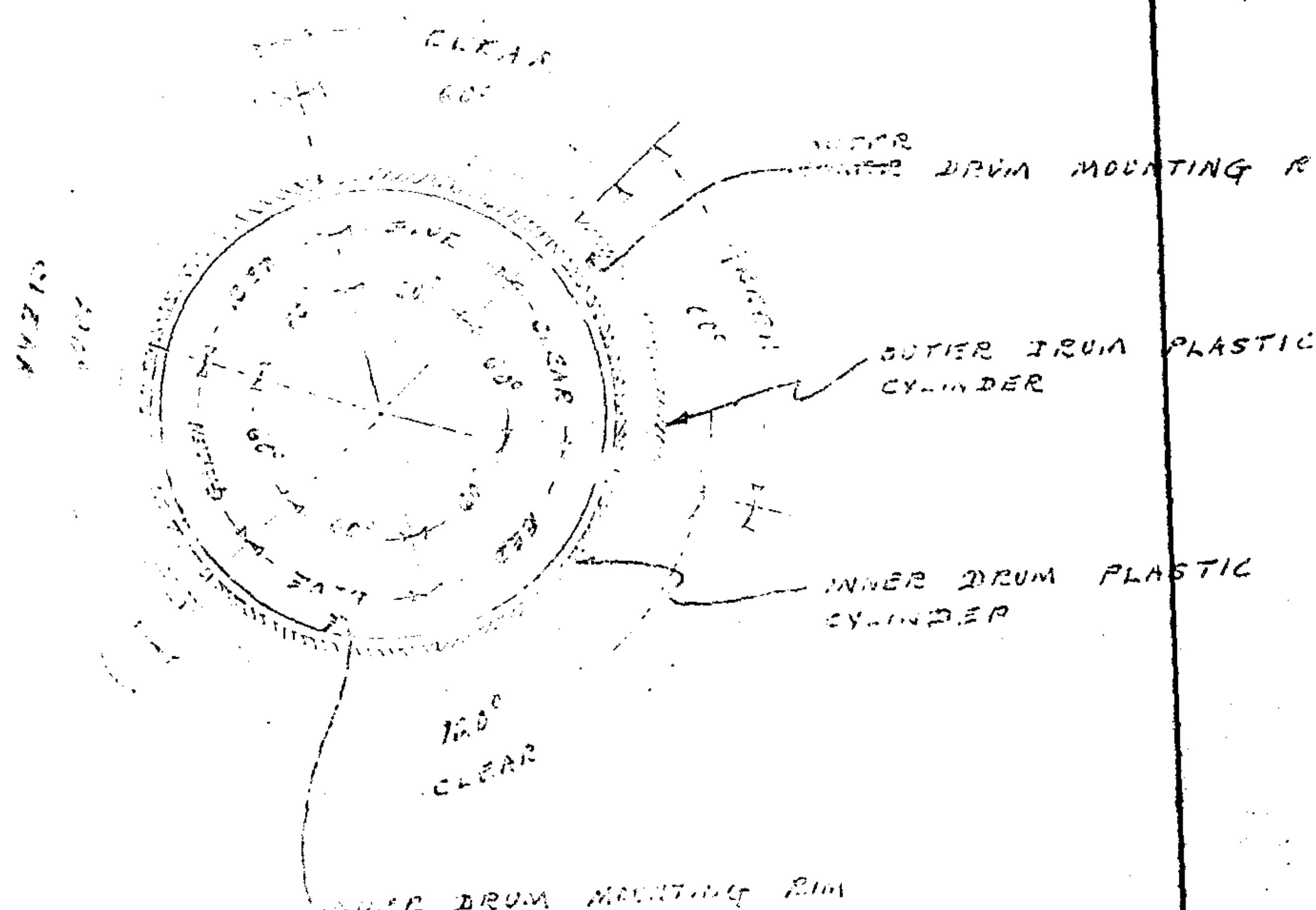
1650 in-lbs.

... # = load on Brg. (B)

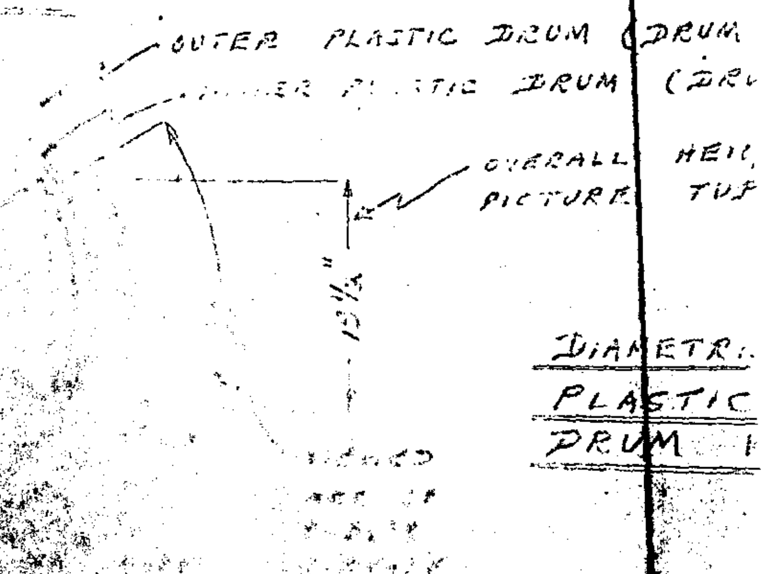
530 # = load on Brg. (A)

... would be ... computations.

SECTORS FOR 20" TUBE

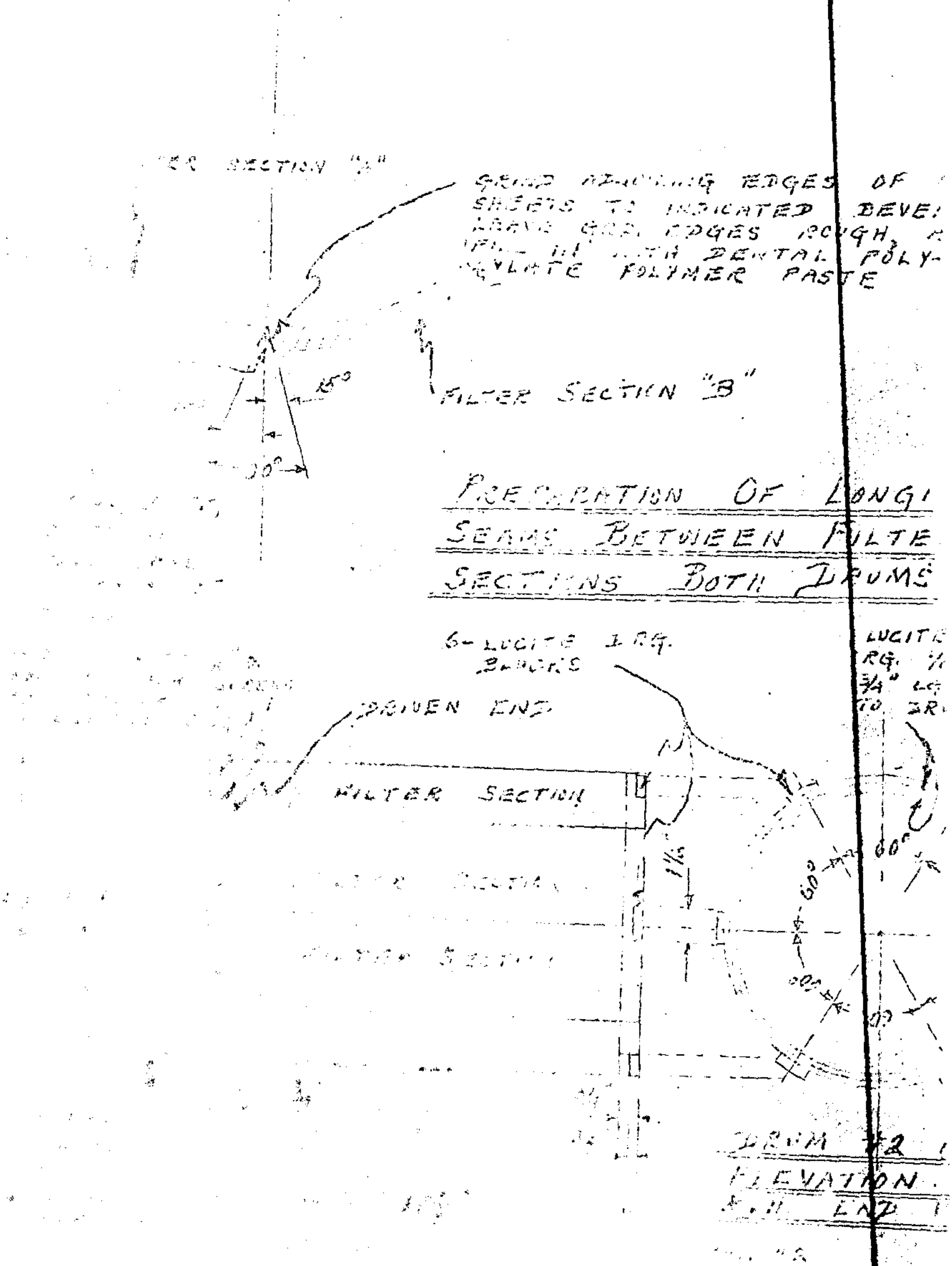


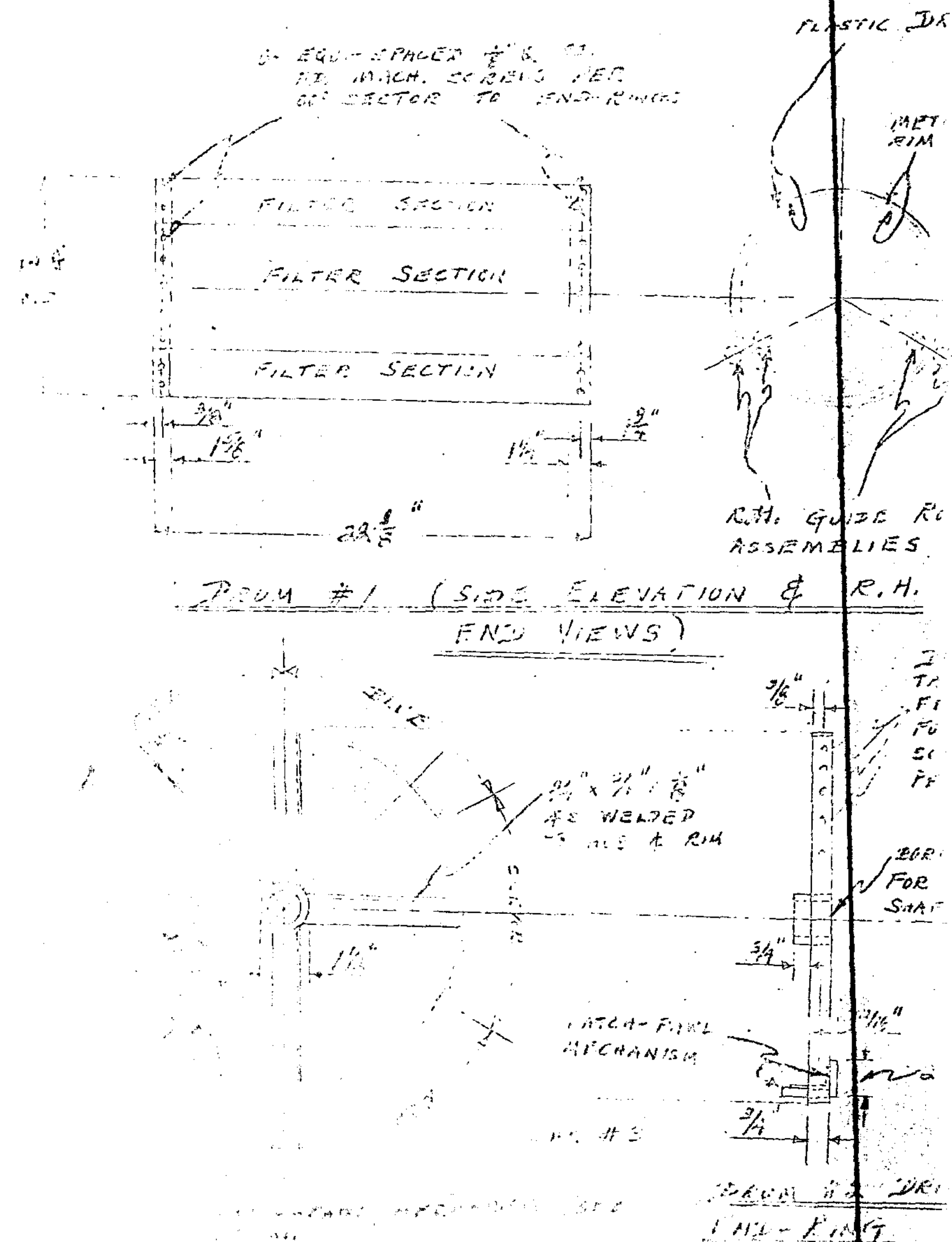
SCHEMATIC SHOWING ARRANGEMENT
OF COLOR SECTORS ON DOUBLE-
DRUM ASSEMBLY



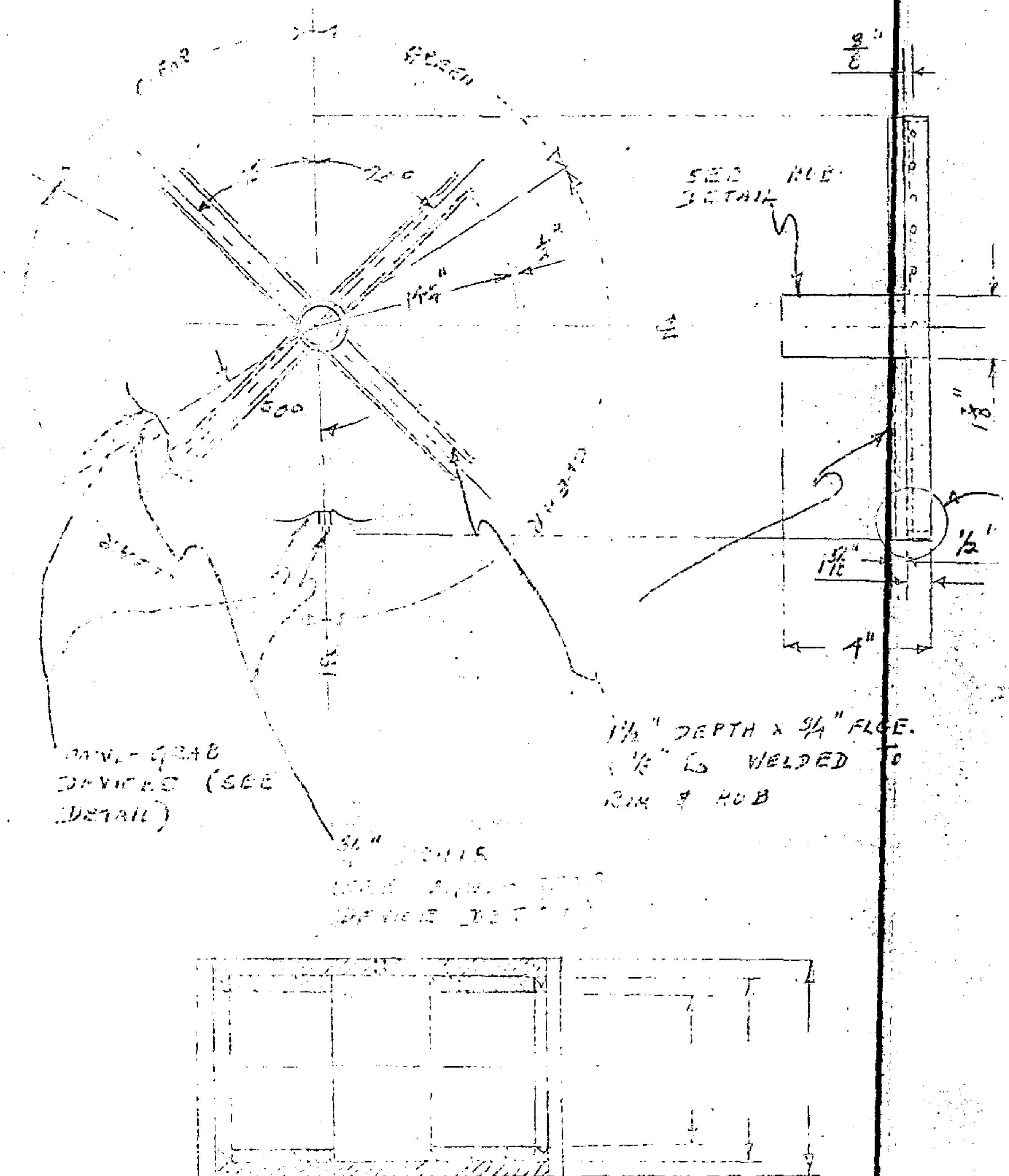
DIAMETR
PLASTIC
DRUM

SHT. #


SECTION "A"
GRIND ABUTTING EDGES OF
SHEETS TO INDICATED BEVEL
LEAVE GRD. EDGES ROUGH,
FILL IN WITH DENTAL POLY-
CRYLATE POLYMER PASTE
45°
30°
FILTER SECTION "B"
PREPARATION OF LONGI
SEAMS BETWEEN FILTE
SECTIONS BOTH DRUMS
6-LUCITE
BLOCKS
LUCITE
DRIVEN END
FILTER SECTION
1½
60°
60°
60°
DRUM #2
ELEVATION
END



FILTER SECTION
FILTER SECTION
PLASTIC DR
RIM
R.H. GUIDE R
ASSEMBLIES
DRUM #1 (SIDE ELEVATION & R.H. END VIEWS)
WELDED
MECHANISM
FOR


SEE HUB DETAIL
4"
1½" DEPTH x ¾" FLGE.
WELDED TO
RIM & HUB
HAND-GRAB
DEVICES (SEE
DETAIL)

FD-141
(1-13-48)

BULKY EXHIBIT

Date received 7/9/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Ultimate disposition to be made of exhibit Retained
Estimated date of disposition-To be decided at conclusion of case.

List of contents:

128. Two photostatic copies of thesis dated 7/6/51 together with two photostatic copies of drawing entitled "Switching Circuit for Double-drum Arrangement".

74

100-95068-1B

Carbon Copies:-

Sheets (1) thru (4) and computation sheets replace the material previously sent and evidently misplaced. Sht. (19) is the relay circuit for the automatic switching and alignment arrangement. Full explanation follows Monday.

A.

July [illegible]

OBJECTIVES:-

The device proposed on Sketch Sheets (1) thru ([illegible]) is intended to serve as the "color wheel" component of a [illegible] type color television receiver. The following objectives have been kept in mind in laying down the preliminary sketches which these sheets are intended to convey:-

(1) principally, the driving motor position to extend color reception to the larger sizes of C.R. tubes;

(2) secondly, the goal has been to combine both black & white and color reception in the same C.R. tube; and,

(3) finally, to achieve goal [illegible], to achieve the objectives set down in (1) and (2) without having to go to singularly-appearing cabinet designs.

FUNDAMENTAL PRINCIPLES OF THE PROJECTED DESIGN

A guiding principle of the presently-employed "color wheel" is that which holds that the diameter of the "wheel" must be the diameter of the screen plus two inches. This consideration, and the problems which it entails in both mechanical design and cabinet design, lies at the bottom of the thought that the "color wheel" is limited as to the size of screen which it will accommodate on a practical basis.

The design projected on Sketch Sheets (1) thru ([illegible]) looks to the use of a "color drum" (or "color cylinder"). The drum or cylinder principle, being in the main entirely an "overlay", is avoided. (By "overlaying", reference is made to the fact that the conventional "color wheel" in that [illegible] [illegible] a center which [illegible] actually more than [illegible] the viewed screen.]

[illegible] illustrates [illegible] between the C.R. [illegible] assembly. It will be [illegible] suited to such kind [illegible] the length of the color- [illegible] minimum distance [illegible] provide [illegible] practical supporting and [illegible] screens, it is [illegible] the length of the [illegible] being distributed [illegible] of the viewed screen.

[illegible] the color- [illegible] that the drum [illegible] the fundamental accomo- [illegible] reception on the same C.R. [illegible] consisting of two concentric [illegible] between the two shells is [illegible] of the double-drum [illegible] color viewing on the [illegible]

[illegible] consists of 3 properly sequenced [illegible] of the same arc.

[illegible] of 3 equal- [illegible] filter sections, [illegible]

[illegible] filter sectors of the outer drum complete the [illegible] by the inner drum filter- [illegible]

[illegible] the top
[illegible] on the
[illegible] #1

(1) [illegible] should be [illegible] the [illegible] positions selected [illegible] for [illegible] filter section of the [illegible] within [illegible] of the sector sequence [illegible] by the [illegible],— which for black and white viewing [illegible] the filter section of the [illegible] of the clear sections of the outer drum.

[illegible] drawing, the complementary positioning of the two drums for color viewing [illegible] the point [illegible] of the [illegible], while the proper alignment of the two drums for black-and-white reception is based on both drums [illegible] sectors.

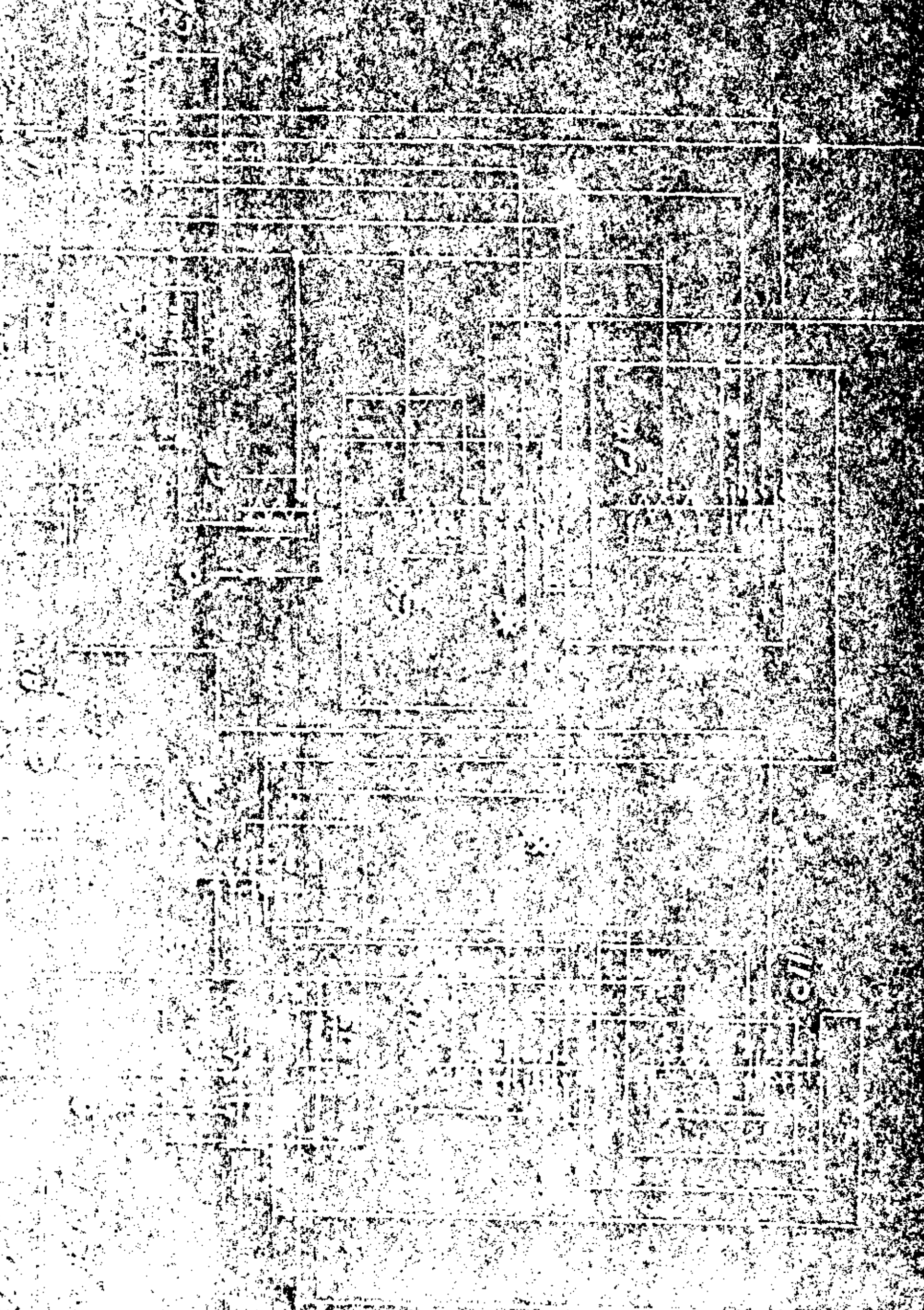
The ideas implicit in [illegible] (1) [illegible] (2) [illegible] sectors, together with the [illegible] for [illegible], [illegible] better means of aligning the [illegible] sectors of the inner drum with the [illegible] color sectors of the outer drum, [illegible] within the point [illegible] of the properly matched color sectors of both drums must be assured when color viewing is selected; and [illegible] that for black-and-white viewing both the [illegible] positioning of the inner and the outer drums should be assured. [illegible] a latching and a properly [illegible] positioning mechanism is indicated. Therefore, the projector [illegible] three [illegible] first [illegible] latching, aligning, and positioning mechanisms.

The latching, aligning, and positioning mechanism,— which will hereafter be referred to as the L.A.P. mechanism,— is built around the following features:

a) [illegible] directly-driven drum [illegible] (see [illegible] 10) as the main drum, and the indirectly-driven drum as the outer drum;

b) the aligning of the one filter-section of the outer drum with the [illegible] of inner drum — strictly for a proper alignment of the two drums for black-and-white viewing [illegible] (see [illegible] [4], [5], [6], [7], and [4]) [illegible] pawl ([illegible] [ ] and [2]) which is [illegible] gate ([illegible] 7 and [15]) shown as 60° [illegible] from the [illegible] centerline [illegible] be ejected from the [illegible] by the action of the solenoid-actuated plunger [illegible] the [illegible] release latch-pawl and the [illegible] rotated thru a 300° [illegible] which [illegible] held stationary by [illegible] solenoid plunger, and that the [illegible] be engaged in [illegible] of the [illegible] shown on the vertical centerline of [illegible] of the [illegible] [illegible]

(To be continued)



Carbon Copies:-

Sheets (1) thru (4) and computation sheets replace the material previously sent and evidently misplaced. Sht. (19) is the relay circuit for the automatic switching and alignment arrangement. Full explanations follow Monday.

A

July [illegible]

OBJECTIVES:-

The design projected in Sketch Sheet (1) [illegible] is intended for service with the "color wheel" compound [illegible] C.B.S. type color receiver. The following objectives have been kept in mind in laying down the preliminary study which these sketches are intended to convey:-

1) principally, the driving motor [illegible] to extend C.B.S.-color reception to the larger sizes of C.R. tubes;

2) secondly, the goal has been to secure both black & white and color reception on the same C.R. tube; and

3) finally, another goal has been to achieve the objectives set down in (1) and (2) without having to go to ungainly appearing cabinet designs.

FUNDAMENTAL PRINCIPLES OF THE PROJECTED DESIGN:-

A guiding principle of the presently-employed "color wheel" is that which holds that the diameter of the "wheel" must be the diameter of the screen plus two inches. This consideration, and the problems which it entails in both mechanical design and cabinet design, lies at the bottom of the thought that the "color wheel" is limited as to the size of screen which it will accommodate on a practical basis.

The design projected on Sketch Sheets (1) thru [illegible] turns to the use of a "color drum" (or "color cylinder") in the form of cylinder portions, thus is the means whereby an "overlap" is avoided. (By an "overlap" reference is made to the fact that the conventional "color wheel" must rotate about a center which i [illegible] (actually more than [illegible] the viewed screen.]

[illegible] illustrates [illegible] between the C.R. [illegible] assembly. It would be [illegible] to subtend [illegible] the length of the color- [illegible] that minimum distance [illegible] screen [illegible] provide [illegible] practical supporting and [illegible] screen, it is [illegible] the length of the [illegible] being distributed [illegible] of the viewed screen. [illegible] comprising the color- [illegible] follows that the drum [illegible] fundamental accomo- [illegible] reception on the same C.R. [illegible] consisting of two concentric [illegible] between the two shells so [illegible] of the double drum [illegible] color viewing on the [illegible]

[illegible] properly-sequenced [illegible] section of the same arc. [illegible]

[illegible] of 5 equal- [illegible] filter section;

[illegible]

[illegible] filter-sector of the outer drum complete the [illegible] established by the inner drum filter- [illegible]

See the top view for this: #1

(d) The two drums be capable of having their relative positions altered so that, for color-viewing, the one filter-section of the outer drum properly complements the color-sequence established by the 3 filter sections of the inner drum; — while, for black and white viewing, the clear section of the inner drum is complemented by any of the clear sections of the outer drum.

Quite obviously, the complementary positioning of the two drums for color-viewing involves the joint rotation of both drums; while the proper alignment of the two drums for black-and-white reception is based on both drums remaining stationary.

The ideas implicit in (a), (b), (c) and (d) above, together with the comments which follow (d), mean that a positive means of aligning the 3 color-sections of the inner wheel with the 1 color section of the outer one must be provided, meaning that the joint rotation of the properly matched color-sections of both wheels must be assured when color-viewing is desired; and [illegible] that, for black-and-white viewing, both the accurate positioning of the inner and the outer drums should be assured. Clearly, a latching and a properly [illegible] positioning mechanism is indicated. Therefore, the proposed [illegible] [illegible] just such a latching, aligning, and positioning mechanism.

The latching, aligning, and positioning mechanism, — which shall hereafter be referred to as the L.A.P. mechanism, — [illegible] shall [illegible] the following [illegible]:

(a) [illegible] the [illegible] inner drum, and the [illegible] drum to the outer drum;

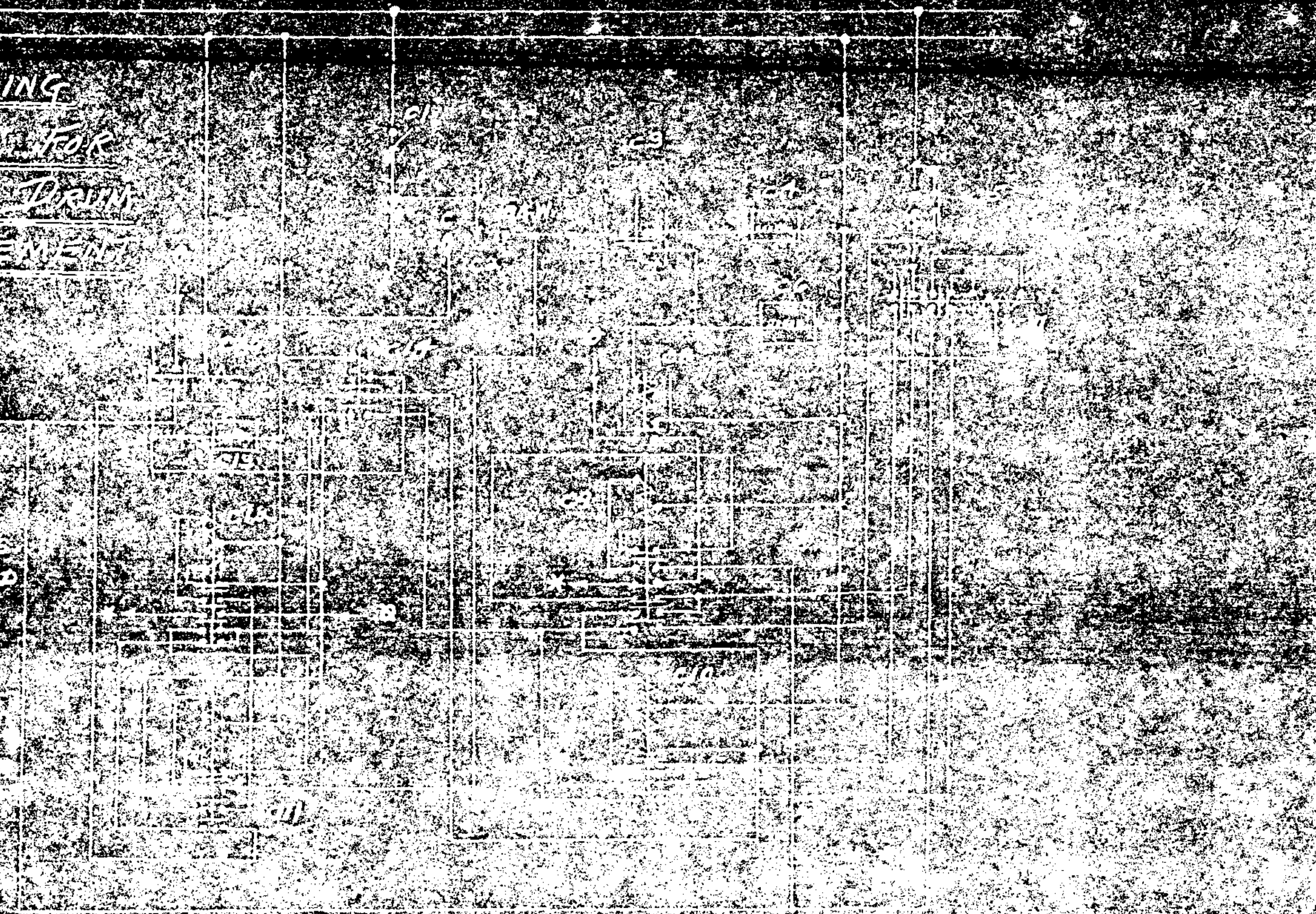
(b) The aligning of the one filter section of the outer drum with the [illegible] of inner drum — [illegible] proper alignment of the two drums [illegible] viewing;

[illegible] provides (see Ilts [14], [15], [5], [7], and [4]) that the spring-loaded latch-pawl (Ilts [5] and [15]) which is located in the grab (Ilts [7] and [15]) shown as 60° off the vertical centerline on Ilt [4] be ejected from the grab slot by the action of the solenoid-actuated plunger (Ilt [15]); that the so-released latch-pawl and the ~~inner~~ outer drum of which it is a member be rotated thru a 300° arc of travel while the inner drum is held stationary by the continuously-energized solenoid & plunger, and that the latch pawl member of the outer drum then be engaged in the grab slot of the grab shown on the vertical centerline of Ilt [4].

(To be continued)

SWITCHING CIRCUIT FOR DOUBLE-DRUM ARRANGEMENT

* INDICATES [illegible]ASE FED [illegible] MOTOR



FD-141
(7-1-48)

BULKY EXHIBIT

Date received 9/27/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained USA-SDNY

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

127. Photostatic copy of decision of Circuit Court of Appeals in case entitled US v BROTHMAN & MOSKOWITZ.

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100-95068-1B

UNITED STATES COURT OF APPEALS

FOR THE SECOND CIRCUIT

No. 290—October Term, 1950.

(Argued June 14, 1951 Decided July 26, 1951.)

Docket No. 22039

UNITED STATES OF AMERICA,

Appellee,

—v.—

ABRAHAM BROTHMAN and MIRIAM MOSKOWITZ,

Appellants.

Before:

SWAN, *Chief Judge*, AUGUSTUS N. HAND and L. HAND,

Circuit Judges.

Appeal from the United States District Court for the Southern District of New York.

From judgments of conviction and sentence after trial upon an indictment charging both defendants with conspiracy to obstruct justice and defendant Brothman alone with the substantive offense, the defendants have appealed. Affirmed on conspiracy count; reversed on substantive count.

JOHN MCKIM MINTON, *Attorney for appellant Brothman*; William F. McNulty, of counsel.

WILLIAM L. MESSING, *Attorney for appellant Moskowitz.*

IRVING H. SAYPOL, United States Attorney, *for appellee*; Bruno Schachner, Roy M. Cohn, John M. Foley and Stanley D. Robinson, Assistant United States Attorneys, of counsel.

SWAN, *Chief Judge*:

These are appeals from judgments of conviction and sentence upon an indictment which charged both appellants with the crime of conspiracy, 18 U. S. C. §88 (1946 ed.), and Brothman alone with the substantive offense of endeavoring to persuade a witness to give false testimony before a federal grand jury, 18 U. S. C. §241 (1946 ed.). Brothman was sentenced to consecutive terms of 2 and 5 years and fines of $10,000 and $5,000 on the respective counts. Moskowitz was sentenced to 2 years' imprisonment and fined $10,000. Brothman's appeal raises a single issue, namely, failure to prove venue of the substantive offense. The appeal of Moskowitz challenges the sufficiency of the evidence to prove her participation in the conspiracy, and asserts prejudicial error in the prosecution's summation.

We address ourselves first to the conspiracy count. In the summer of 1947 a federal grand jury in and for the southern district of New York was conducting an investigation of possible violations of the espionage laws. Brothman and one Gold were summoned to appear as witnesses before this grand jury. The conspiracy count charged that both appellants together with Gold, who was named as a conspirator but not as a defendant, agreed that Brothman should give false testimony before the grand jury, should inform Gold thereof, and Gold should likewise give false testimony consonant with Brothman's. The case against the appellants was made largely by the testimony of Gold. Moskowitz does not question the sufficiency of the evidence to prove that such a conspiracy existed between Brothman and Gold, but contends that she was not shown to have been a party to it. An examination of the record convinces us beyond doubt that the contention is groundless. Without discussing the evidence in detail it will suffice to refer to a few incidents which indicate that she repeatedly assisted in making jibe the false stories of the two main actors. After Gold had been interviewed by agents of the Federal Bureau of Investigation, he recounted in the presence of Brothman and Moskowitz what he had told the agents, and Brothman remarked that he had made "a very fine choice of a story." The inference that the story was false must have been obvious to Moskowitz. She was also present when Gold refused to tell Brothman about his espionage activities because Brothman "was already deeply enough involved." When Brothman was considering testifying before the grand jury to a story different from that he had originally told the F. B. I. agents Moskowitz expressed concern and told Gold she was going to tell Brothman to try to stick to the original story; and she later told Gold that she and attorney Needleman persuaded Brothman to do so. Finally, on the night before Gold was to testify, Moskowitz said that she wished to go home early "so that Abe Brothman and I would have plenty of time to match our stories before my appearance before the grand jury the next morning."

The next contention of appellant Moskowitz is that she was prejudiced by repeated statements in the prosecutor's summation that the defense had failed to contradict the government's testimony. It is conceded that as a general rule a reference to the testimony for the prosecution as uncontradicted is not an indirect comment on the defendant's failure to testify, but the appellant contends that an exception exists where the only persons who could contradict the testimony are the defendants themselves.[1] Assuming *arguendo* that such an exception should be recognized, we do not think that the appellant's case falls within it. The prosecutor's comments were general and made without express reference to Moskowitz. It is possible to explain them as covering occurrences as to which contradiction could have come from others than this appellant. For example, the comment to which objection was first interposed was the following: "The truth of the testimony offered here by Miss Bentley, Gold and others is conclusively established by the failure of the defense to produce one solitary word contradicting any of this testimony." In overruling the objection the court stated, "I will deal with that later properly myself." And in his charge the judge instructed the jury that they may not "infer guilt nor even draw a single unfavorable inference against the defendants because they did not take the stand." We think this was all that was required.[2]

We turn now to Brothman's appeal. The court's charge limited the substantive crime to endeavoring to influence Gold to give false testimony, and the jury was told that the Government did not have to prove the success of the

1. See *Linden v. United States*, 3 Cir., 296 F. 104; *Barnes v. United States*, 8 Cir., 8 F. 2d 832.

2. See *Lefkowitz v. United States*, 2 Cir., 273 F. 664, 668, cert. den. 257 U. S. 637; *United States v. Shapiro*, 2 Cir., 103 F. 2d 775, 776; *United States v. Di Carlo*, 2 Cir., 64 F. 2d 15, 17; *United States v. De Vasto*, 2 Cir., 52 F. 2d 26, 30, cert. den. 284 U. S. 678; *Boehm v. United States*, 8 Cir., 123 F. 2d 791, 810.

endeavor. Concededly all of Brothman's "endeavors" to influence Gold's testimony took place in the eastern district of New York, although Gold's testimony was given in the southern district. The contention on appeal is failure of proof of venue. At the close of the prosecutor's case, Brothman moved for a directed verdict on count 2 on the ground that the evidence was insufficient. This motion was renewed at the end of the entire case. The Government's only answer to the appellant's argument is that Brothman waived his constitutional privilege to be tried where the crime was committed by going to trial in the southern district without objection. Where the indictment discloses lack of venue going to trial without objection to venue is a waiver. *United States* v. *Jones*, 2 Cir., 162 F. 2d 72, 73. There is a dictum in *United States* v. *Michelson*, 2 Cir., 165 F. 2d 732, 734, aff'd, 335 U. S. 469, that the same result may follow if the defendant is warned of the defect during the course of the trial. In the case at bar Brothman could not know that venue would not be proved until the prosecutor's evidence was closed; he then moved for a directed verdict. We may assume *arguendo* that had he argued the motion and said nothing about failure to prove venue, he might be held to have waived the defect. But the motion was denied without argument being heard. In *United States* v. *Jones*, 7 Cir., 174 F. 2d 746, Judge Minton (now Mr. Justice Minton), speaking for the court, held that a motion for acquittal made at the conclusion of all the evidence properly raised the question of venue in the court below. Such a motion need not specify the grounds therefor. We agree with the Seventh Circuit decision. Accordingly Brothman's conviction on count 2 must be reversed. The conviction of both appellants on the conspiracy count is affirmed.

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135—7-27-51 USCA—2362

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/20/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E. E. Thompson

Address Warden, Federal Detention Headquarters

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

128. Photostatic copy of paper entitled "Drawing #1" together with envelope addressed to N. GABORIAULT, Pres., Techniflex Corp, Port Jervis, NY
129. Photostatic copy of paper entitled "Drawing #2" together with envelope addressed to OSCAR THALER, 3107 Bedford Avenue, Brooklyn, NY.
130. Photostatic copy of drawing showing various views and positions of a color television tube.

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100-95068-1B

[illegible]

[illegible]

[illegible]

[illegible]

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/30/51

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal House of Detention

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

131. Photostatic copy of paper entitled "Drawing #3."
132. Photostatic copy of paper entitled "Drawing #4."
133. Photostatic copy of paper entitled "Drawing #5."
134. Photostatic copy of paper entitled "The Kiriascope for 20" Rectangular C R Tube.
135. Photostatic copy of envelope addressed to N. GABORIAULT.

717

100-95068-1B

SEARCHED ... INDEXED ...
SERIALIZED ... FILED ... 8
AUG 2 1951
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Detail "E" – The bracket assembly component of the [illegible] assembly

Item "EA" – Sector [illegible] of bracket assembly

Item "EB" – Pin Sector [illegible] of bracket "

Item "EC" – Bushing [illegible]

([illegible])

Item "ED" – Sector [illegible] holder [illegible]

[illegible]

[illegible]

Detail H – Outer Drum [illegible] (LH)

[illegible] M [illegible]

Item "MA" –

[illegible]

Item "MB" – [illegible]

Item "MC" – [illegible]

1 [illegible]

2 [illegible] B.B.

3 [illegible]

[illegible]

4 [illegible]

5 [illegible]

[illegible] #3

[illegible] to [illegible]

[illegible]

[illegible]

[illegible]

8 Contact rings formed [illegible] $\frac{1}{8}$" [illegible] of an [illegible] copper with 1 longitudinal [illegible] to [illegible] [illegible] contact rings $\frac{3}{32}$" apart

9 [illegible] long Allen [illegible] set screw

10 [illegible] drive shaft

11 Bakelite Molding (a [illegible] or polymethac[illegible] [illegible] (whichever is [illegible]) [illegible] [illegible] to [illegible] [illegible]

12 [illegible] 2 each [illegible] [illegible] #[illegible]

13 [illegible] posts for mounting [illegible]

14 Fixed [illegible]

15 [illegible] hold [illegible]

16 [illegible] brush holder [illegible] polystyrene [illegible]

17 [illegible] $\frac{1}{8}$" [illegible] stainless steel [illegible] [illegible] drill [illegible] $\frac{3}{32}$"

18 [illegible] #[illegible]

19 [illegible] with $\frac{1}{4}$" [illegible] slot

20 Stainless steel [illegible] inserted into carbon brush

21 Carbon brush

22 [illegible]

23 Stainless steel tube stock

24 [illegible] #17

[illegible] position of [illegible] in ~~#~~ #16 [illegible] same [illegible] #12

44. Approach Block

Dwg. #3 p.3

26. $1\frac{1}{4} \times 1\frac{1}{4} \times \frac{1}{8}$ Alum. angle

27. $\frac{3}{4} \times \frac{3}{4} \times$ [illegible] " "

28. ~~[illegible]~~ To be formed from Alum. Bar Stock, Detail "B"

29. See Item "HB" & "HC"

30. To be formed from Alum. Bar stock, Detail "A"

31. See Item "HB"

32. Hub Housing to be formed from $1\frac{7}{8}$" O.D. x $1\frac{3}{8}$" I.D. Alum. Tube Stock.

33. ~~[illegible]~~ $\frac{1}{4}$" Diam x $3\frac{1}{2}$ long Allen Hdless Set Screw. See Item "HC" for true position

34. Felt seal

35. Cover PLATE

36. " "

37. $1\frac{3}{8}$ OD x $1\frac{1}{8}$ ID x 1" long Porous Bronze bearing

38. Alloy [illegible] to cut as shown [illegible] the [illegible] be cut so it [illegible] a [illegible] height [illegible] the ~~[illegible]~~ [illegible] the [illegible] begins.

39. [illegible] long [illegible] machine screw

40. Key [illegible]

41. [illegible]

42. [illegible]

43. [illegible]

44. [illegible] drill

45. [illegible]

46. [illegible] [illegible] [illegible] Travel

47. [illegible] Block

DWG. #1

1. See Item "I-B"
2. 3/4" x 3/4" x 1/8" aluminum angle spokes
3. 1 1/4" x 1 1/4" x 3/16" aluminum angle rim
4. Indicates the positions of the 6 equi-spaced Permalloy plates on the assembled unit
5. Aluminum hub (machine from 4" O.D. x 1 5/8" I.D. tube stock, or from a 4" round bar stock piece)
6. 6-equispaced (on a 3 3/4" D.S.C.) holes, drilled and tapped for 1/4" ø round head machine screws 7/8" lg.
7. 6-1/4" ø round head machine screws, 7/8" lg.
8. Nice 7600 series, 1 3/4" shaft size, ball bearing (6) {shrinking fit into housing}
9. Aluminum cover-plate (though indicated as a 1/4" thk. plate, a 1/16" thk. piece would more than suffice)
10. ditto (9)
11. 2-3/8" diameter x 5/16" lg. capscrews & nuts
12. 3/4" x 3/4" x 1/16" aluminum angle end-ring (R.H.) — ring to have 25 1/2" O.D.
13. roller support member for R.H. end of inner drum, — 6 equispaced units, — see Dwg. #1
14. Outer Drum End-Ring (R.H. side).
15. Split Pillow Block (see Dwg. #3)
16. Mild Steel anchor member for Stationary Shaft "second support point" (see Dwg. #5)
17. S.A.E. 1020 seamless steel tube stock Stationary Shaft machined as per Dwg. #5
18. Hollow Shaft component of C.R. Tube Support Assembly, — of seamless S.A.E. 1020 tube stock

19. 1/4" x 1/4" x 1 1/2" lg. key attaching anchor member (16) to hollow shaft (17)
20. Tongue member of anchor (see Dwg. #5)
21. 1/4" Ø x 3/4" lg. capscrews and bolts - 2 req.
22. Frame anchor plate to which (16) is tied (See Dwg. #5)
23. 1" x 1" x 1/8" angle iron to which (22) is welded (See Dwg. #5)
24. 3/4" x 3/4" x 1/8" angle iron leg of R.H. end A-Frame (See Dwg. #5 for details and true spatial relationship of A-frame members to one another and to drum)
25. Boston Gear Works B-2226-16 Plain Cylindrical Bost Brong bearing, one each end as indicated, machined to friction fit with interior of (17) and exterior
26. Outline of tube, indicating clearance of Outer Drum end-ring R.H. spoke from tube
27. 1/4" x 1/4" x 1 1/2" key attaching Bracket to Hollow Shaft Member of C.R. Tube Support Assembly
28. 2 - 1/4" Ø x 3/4" lg. capscrews and bolts
29. 1/8" Mild Steel plate, re-inforced as indicated in Tube Support Plate Detail
30. 3/4" x 3/4" x 1/8" angle iron stiffener, welded down length of the underside of (29)
31. 1 1/4" x 3/4" x 1/8" angle iron stiffening running roughly half-way across the underside of support plate (29) at each of its two points of support by Bracket
32. 1" x 1" x 1/8" horizontal members of Bracket
33. Bracket (See Bracket Detail)
34. Pressed Steel Clip to which Focusing and Deflection Coils Bracket is attached

Dwg. #4

35. 1" x 1" x 1/8" ∠ vertical member of Bracket
36. 3/8" x 3/4" x 1/8" ∠ stiffener across width of underside of plate, welded to plate and to (30) as indicated in Front-End Elevation View of Tube Support Detail
37. See (44) and (45)
38. Hinge of Tube Strap Member to Support Plate
39. Pressed Brass Tube Strap Member (See Front End-Elevation View of Tube Support Plate)
40. Hub of Bracket, of 2 3/4" O.D. x 1 1/2" I.D. S.A.E. 1020 Seamless steel tube stock
41. Keyway for 1/4" x 1/4" x 1 1/2" lg. key as per (27)
42. 1" x 1" x 1/8" ∠ arch arm of Bracket
43. 1/8" Thk. stiffener plate welded to angle arms & hub
44. collapsed soft rubber tubing forming soft shoulder for bottom-side of C.R. Tube
45. Plywood base following contours of underside of tube
46. rubber lining of 1/8" Thk. for (39)
47. flange of (39)
48. Hole for 1/4" diameter carriage bolt and wing-nut fastening between (39) and top-member of strap

Dwg #5

1. Shoulder bearing against inner race of ball bearing in Outer Drum R.H. End Ring hub [NOTE:- Shaft, at its reduced diameter, to be a tunking fit into inner race]
2. Keyway for ¼" x ¼" key fixing Stationary Shaft against rotation in pillow block [NOTE:- Keyway to extend for 4¾" in length from indicated R.H. end of Shaft]
3. Drill and tap for ⅜" setscrew which threads into Stationary Shaft. Fit of setscrew into tapped hole to be "force fit" [NOTE:- Lower ¼" of setscrew to be machined down to ⅛" ø and to fit snugly into corresponding hole ⑩ in Hollow Shaft. Shoulder on set-screw because of machined-down end to seat tightly against inner Hollow Shaft]
4. Keyway for ¼" x ¼" x 1½" lg. key between Stationary Shaft and Stationary Shaft Anchor
5. Setscrew, Allen Hollow ⅜" ø, ⅞" lg of description in ③ rather than as indicated
6. Keyway in Stationary Shaft Anchor matching ④
7. Interior of Anchor to have a snug fit into Stationary Shaft
8. Torque Member of Anchor
9. Drill for ¼" ø bolts passing thru
10. ⅛" ø drill for setscrew prong as mentioned in Item #3 above
11. Keyway for ¼" x ¼" x 1½" lg. key between Bracket Hub and Hollow Shaft
12. Drum Assembly
13. Split Pillow Block support for R.H. End of Drum Assembly
14. 1" x 1" x ⅛" Top member of A-frame (See Items "LB" and "LC")
15. ditto ⑭

Dwg #5

16. Frame tongue to which ⑧ is tied

17. 1" x 1" x 1/8" L horizontal member to which ⑯ is welded (See Items "LB" and "LD")

18. Gusset Plate (See Item "LG") [NOTE: Actually each gusset plate will be in two parts as required by Item "LB"] — 1/8" PL

19. Gusset Plate (See Items "LF" and "LB") — 1/8" PL

20. 1" x 1" x 1/8" L horizontal member serving to stiffen and tie together lower ends of uprights, and as a base to which the counting device ~~[illegible]~~ detection element is attached

21. 1¼" x 1¼" x 1/8" L iron uprights

22. Foot Pad (See Detail "F")

23. T.V. Clamps to be tied to upright by way of clips.

24. Gusset Plate (See Item "LH")

25. Gusset Plate (See Item "LI")

26. Drills for 1/4" ⌀ bolts

Mr. N. Gaboriault Pres
Techniflex Corp
Port Jervis, New York
PERSONAL

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/3/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters, N C

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

136. One photostatic copy of paper entitled "Drawing # 6.
137. One photostatic copy of paper entitled "Drawing #7.
138. One photostatic copy of drawing e titled "The Miriascope for a 20" Rectangular C R Tube Drawing #6.
139 One photostatic copy of drawing entitled " The Miriascope for a 20" Rectangular C R Tube Drawing #7.

100-95068-1B
78

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1. B. & W. # [illegible] O.D. x [illegible] I.D. Thrust Bearing (Boston-Bronze) — [NOTE: In the "Side Elevation View", ⑨, which is an identical thrust bearing is not shown in order that the detailed construction of the lever bar bearing be indicated.]
2. [illegible] steel rod shaft, welded as indicated to one leg of the support ③
3. [illegible] x [illegible] x [illegible] structural steel [illegible]
4. [illegible] plywood for rear baseplate to which solenoid is anchored
5. [illegible] x [illegible] of [illegible] & bolt — 4 req.
6. [illegible] pull-force, 110 V, 60 cycle solenoid, equipped with [illegible] spring
7. [illegible] x 12 [illegible] steel baseplate
8. [illegible] x [illegible] x [illegible] structural steel angle
9. [illegible] ①, see NOTE
10. [illegible]
11. [illegible] bearing glued to plywood base
12. plywood [illegible]
13. [illegible] — 4 req.
14. [illegible] O.D. x [illegible] I.D. S.A.E. 1020 seamless steel tubestock, welded to one leg of ③
15. [illegible] O.D. x [illegible] I.D. x [illegible] lg. Boston-Bronze bearing
16. [illegible] for [illegible] ⑪
17. [illegible] x [illegible] lg. steel rod press-fitted into [illegible] wide x [illegible] [illegible] connector link ⑱
18. [illegible] wide x [illegible] [illegible] connector link, fixed by any suitable means to plunger-member of solenoid ⑥.

19. ½" ft mild steel gusset, welded to inside of one leg of ⑤ and to baseplate [NOTE:- ⑤ should be similarly stiffened in the other direction as well.]
20. Keyway for ⅜" x ⅜" x 1½" lg. key between Main Drive Shaft and the hub of the Inner Drum Driven-End End Ring
21. Allen Headless Setscrew used to fix commutator holder into end of Main Drive Shaft [NOTE:- With the setscrew engaged, the top of setscrew is beneath the root of the indicated shaft threads. Threading of the shaft is to be done after the hole for the setscrew has been drilled and tapped.]
22. 11 threads/inch male thread, medium fit-to-backing-up nut. [NOTE: Backing-up nut to be driven with a lock-washer against the inner race of the 1⅞" shaft-size bearing.]
23. Keyway for ½" x ⅛" x ⅞" lg. key between gear ㉙ and Main Drive Shaft
24. Commutator & brush assembly for relay circuit.
25. 1⅞" shaft size ball bearing pillow block.
26. Drive motor (further information, next communication)
27. Output shaft of drive motor, here taken to be ½" ⌀
28. Helical Gear (specified on Dwg. #1) on output shaft of motor
29. " " (" " " ") " Main Drive Shaft
30. 1¾" shaft size ball bearing pillow block
31. ¼" ⌀ capscrew threaded into baseplate ㊸
32. ~~½" ft mild steel composite~~ outboard bearing for output shaft of Motor Drive
33. ¼" ⌀ capscrew and bolt to baseplate ㊷
34. spoke of Outer Drum Driven-End End Ring

DWG. #6

35. Spokes of Inner Drum Driver - End End Ring
36. Hub " " " " " " "
37. $\frac{1}{4}$" x $\frac{1}{4}$" x $1\frac{1}{2}$" lg. key between Main Drive Shaft and Inner Drum Driver - End End Ring
38. 1" x 1" x $\frac{1}{8}$" structural steel ∡ top horizontal member of L.H. A-frame
39. $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{8}$" " " ∡ legs of L.H. A-frame
40. Horizontal member of A-frame knee-brace for baseplate (42)
41. Strut " " " " " " " " "
42. $\frac{1}{4}$" Pl. mild steel baseplate for L.H. end assembly
43. Baseplate for $1\frac{1}{2}$" shaft-size pillow block
44. Capscrew and bolt for connecting motor to baseplate (47) - 4 req.
45. $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{8}$" structural steel ∡ stiffener for baseplate (47) - 2 req.
46. $\frac{1}{4}$" Pl. mild steel gusset tying (47) to baseplate (42)
47. $\frac{1}{4}$" Pl. mild steel baseplate for Drive Motor
48. $\frac{3}{8}$" ∅ capscrew threading into baseplate (43) to tie (43) to (42)
49. $\frac{3}{8}$" x 1" x $\frac{3}{8}$" lg. capscrew and bolt tying baseplate (42) to knee-brace (40)

FIG. No. 7

Page 1

1. $\frac{1}{16}$" ∅ x $\frac{3}{8}$" lg. rd. hd. mach. screws – 6 req.
2. $\frac{1}{16}$" pl. mild steel cover-plate for outboard bearing.
3. Nice 1600 series $\frac{1}{2}$" shaft-size ball bearing
4. ~~$1\frac{3}{4}$" O.D. x $1\frac{1}{4}$" I.D. tube steel housing for ball bearing~~ Housing for ball bearing from $1\frac{3}{4}$" O.D. x $1\frac{1}{4}$" I.D. seamless steel S.A.E. 1020 tube-stock
5. drill and tap for $\frac{1}{4}$" ∅ capscrew
6. outboard bearing for output shaft of motor drive
7. drill and tap for $\frac{1}{4}$" ∅ capscrews tying $1\frac{1}{4}$" shaft size ball bearing pillow block to pad plate
8. horizontal centerline of L.H. end drive assembly
9. $\frac{11}{64}$" thk. pad plate (mild steel)
10. Positioner "B"
11. Brake Assembly } all three are to rotated 30° counter-clockwise for true positions.
12. Positioner "A"
13. Drive Assembly
14. Horizontal Member of Knee-Brace supports, of $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{8}$" structural steel ∠
15. 1" x 1" x $\frac{1}{8}$" structural steel top-member of L.H. A-frame
16. $\frac{1}{8}$" pl. mild steel gusset plates – 2 req., running between (15) and (19)
17. strut components of Knee-Brace supports, of 3/4" x $\frac{3}{4}$" x $\frac{1}{8}$" structural steel
18. 3/4" x 3/4" x $\frac{1}{8}$" horizontal member of L.H. A-frame
19. main legs of L.H. A-frame, of 3/4" x 3/4" x $\frac{1}{8}$" structural steel
20. fixture for attachment of Positioner "B" – See Detail "F", Item "FB"
21. " " " " " "A" – " " " , " "FD"

DWG. # 7

Page 2

22. ⅝" Pl mild steel baseplate for attachment of Brake Assembly (11)
23. ⅛" Pl " " stiffener plate for (22)
24. 1" x 1" x ⅛" structural steel ~~x ao~~ horizontal member of L. H. A-frame
25. ⅛" Pl mild steel gussets - 2 req., running between (19) and (24)
26. foot pads - See details of R.H. A-frame
27. ⅛" Pl mild steel gusset plate running between bottom plate of Positioner "3" fixture and one leg of (19)
28. ⅛" Pl mild steel vertical baseplate of Positioner "3" fixture member
29. ⅛" Pl mild steel gusset between bottom plate and (28) of Positioner "3" assembly fixture
30. for-and gusset plate, identical with (29)
*. NOTE - The true shape of (27) and the true position of (29) with respect to the main axis of (19) are to be such as to satisfy the orientation axis indicated for the fixture in Item "F3" opposite
*31. ⅛" Pl mild steel gusset running between (33) and one leg of (19)
*32. ⅛" Pl mild steel bottom side gusset running between (33) and the other leg of (19)
33. bottom plate member of Positioner "A" attachment fixture
34. for-and gusset running between (33) and (35)
35. vertical baseplate of Positioner "A" attachment fixture
**. NOTE - The true shapes of (31) and (32) are to be such as to satisfy the orientation axis indicated for this fixture in Item "FA"

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/30/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E.Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit Incabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

140. Two photostatic copies of drawing entitled "The Miriascope For a 20" Rectangular C.R.Tube, Drawings 4 & 5" together with photostatic copy addressed to N. GABORIAULT, Pres, Techniflex Corp, Port Jervis,NY

79

100-95068-1B
SEARCHED ... INDEXED ...
SERIALIZED ... FILED ...
AUG 23 1951
FBI - NEW YORK

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/13/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit retain

List of contents:

141. Two photostatic copies of letter dated 8/10/51 to J.F. & S.E.A.
142. Two photostatic copies of paper entitled "Errata, Addenda, & Comments.
143. Two photostatic copies of pages numbered 112-117.
144. Two photostatic copies of paper entitled Drawing #8 together with drawing.
145. Two photostatic copies of paper entitled Drawing #9 together with drawing.

100-95068-1B 80

SEARCHED INDEXED
SERIALIZED FILED
AUG 1951
FBI - NEW YORK

8/10/51

To:- J.F.
S.E.H.

RE:- Synchronizing Arrangements
for C.B.S. color-TV

A note which I received from Naomi today indicated that perhaps my message relative to the construction of a special motor f[illegible] C.B.S. color-wheel or color-drum units had been misconstrued. [illegible] my last talk with Jack, he conveyed to me the thought that S.L. [illegible] thinking in terms of a special combination of a synchronous-an[d] induction motor (a specially constructed motor) which would [illegible] "[illegible] locked" to the vertical scanning pulse via any of a number of [illegible] linkages. In the message I gave Naomi, I expressed my opinion against such a project both from a technical and from a commercial point of view. I am inclined towards Servo-type li[nkage] between the vertical pulse and the Drive Motor, but, as differentiate[d] from the servo I have seen that C.B.S. uses, I believe that the [illegible] or "gating" section of the servo should operate something [illegible] be more stable in its operating characteristics than a saturable reactor. The thought on which I wanted a decision was whe[ther] I could take the time now to design a Servo of the type I ha[ve] discussed, or whether I should leave this till later and proce[ed] according to Jack's orders with the design of a larger size ([illegible] than S.L. color-wheel — say a color-wheel for a 14" tube). [illegible] I believe that the servo which I have in mind, a[nd] which employs an eddy current (a very light eddy current) [illegible] against a standard motor would be especially suited to the [illegible] device I have designed.

Please discuss this with S.L. and let me have your o[pinion].

I was informed today that drawings 6, 7, 8 & 9 sent [illegible] of la[st] [illegible] Wednesday of this week in two special shipments have not arriv[ed]. [illegible] material contained in these drawings is most essential to the devi[ce] [illegible]. Please see that the finished device awaits these drawin[gs] [illegible] important revisions of the original designs are contained on these.

8/10/51

To:- J.F.
S.E.A.

RE:- Synchronizing Arrangements for C.B.S. color-TV

A note which I received from Naomi today indicated that perhaps my message relative to the construction of a special motor fo[r] CBS color-wheel or color-drum units had been misconstrued. In my last talk with Jack, he conveyed to me the thought that S.L. was thinking in terms of a special combination of a synchronous-and an induction motor (a specially constructed motor) which would [be] "dead-locked" to the vertical scanning pulse via any of a number of non-servo linkages. In the message I gave Naomi, I expressed my opinion against such a project both from a technical and from a commercial point-of-view. I am inclined towards servo-type lin[kage] between the vertical pulse and the Drive Motor, but, as differentiated from the servo I have seen that CBS uses, I believe that the "braking or gating" section of the servo should operate something [a] bit more stable in its operating characteristics than a saturable reactance. The thought on which I wanted a decision was whe[ther] I should take the time now to design a servo of the type I ha[ve] in mind, or whether I should leave this till later and procee[d] according to Jack's orders with the design of a larger size (la[rger] than 12" color-wheel — say a color-wheel for a 14" tube) immediately. I believe that the servo which I have in mind, an[d] would employ an eddy current (a very light eddy current) b[rake] against a standard motor would be especially suited to the D[rive] device I have designed.

Please discuss this with S.L. and let me have your vi[ews].

(single) I was informed today that drawings of 7, 8, & 9 sent Friday of las[t]
(out) and Wednesday of this week in two special shipments have not arrive[d]. Material contained on these drawings is most essential to the devic[e] in construction. Please see that the finished device awaits these drawin[gs] [as] important revisions of the original designs are contained on these.

ERRATA, ADDENDA, & COMMENTS

RE:- PAGES 101-111

* * * * * * * * * * * * *

IMPORTANT

[NOTE:- Check relay C9 on Dwg. #9. The set of contacts in C9 delivering phase supply to the Drive Motor should be a normally-closed set. If Dwg. #9 indicates otherwise, it should be revised in this regard.]

* * * * * * * * * * * * * *

DIFFERENCES BETWEEN THE ORIGINALLY-SUBMITTED CONTROL CIRCUIT & THE ONE GIVEN ON DWG. #9:-

A proposed control circuit for the Miniscope was submitted as Sheet #19 of the original group of sketches, and, this originally-submitted Control Circuit was the basis of the document, pages 101-111, entitled "Description of the Dish Alignment Control Circuit". Since the "Miniscope Control Circuit" as submitted on Dwg. #9 differs in some respects from that given on Sheet #19, the descriptive material given on pages 101-111 will not correspond exactly to the facts of the latterly-submitted circuit. Therefore, this document is submitted to amend and correct pages 101-111 wherever this is required.

The Miniscope Control Circuit, as given on Dwg. #9, differs from that given on the above-mentioned Sht. #19 in the following principal respects:-

a) on Dwg. #9, the signal from the downstream side of the normally-open set of load contacts in the Tachometer Relay C3 is passed to the timing relay C8 and to the Solenoid C6 of

Positioner "A" via a normally-closed set of load contacts in the mechanically-held relay C16, while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay, while on Sht. #19 it appears as a conventional relay;

c) on Dwg. #9, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 3 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.O. unit, and C7 as 1 N.O. - 1 N.C. unit;

and,

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (a) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the Drums for "black and white" viewing has been achieved. By so doing, any A.C. chatter associated with the continued engagement of C6 [the solenoid member of Positioner "A"] and C8 [the on-delay timing relay] is eliminated, and, further, any disturbing effects due to ~~the~~ a continued feeding of these equipment items is eliminated.

trical

Associated with the addition of C16 to the "black-and-white alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specification for C9. From a reading of pages 101-111, it will be observed that —

A. when the arresting of the Drum Assembly and the disengagement of the latch-pawl from Grab "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing, C9 is engaged;

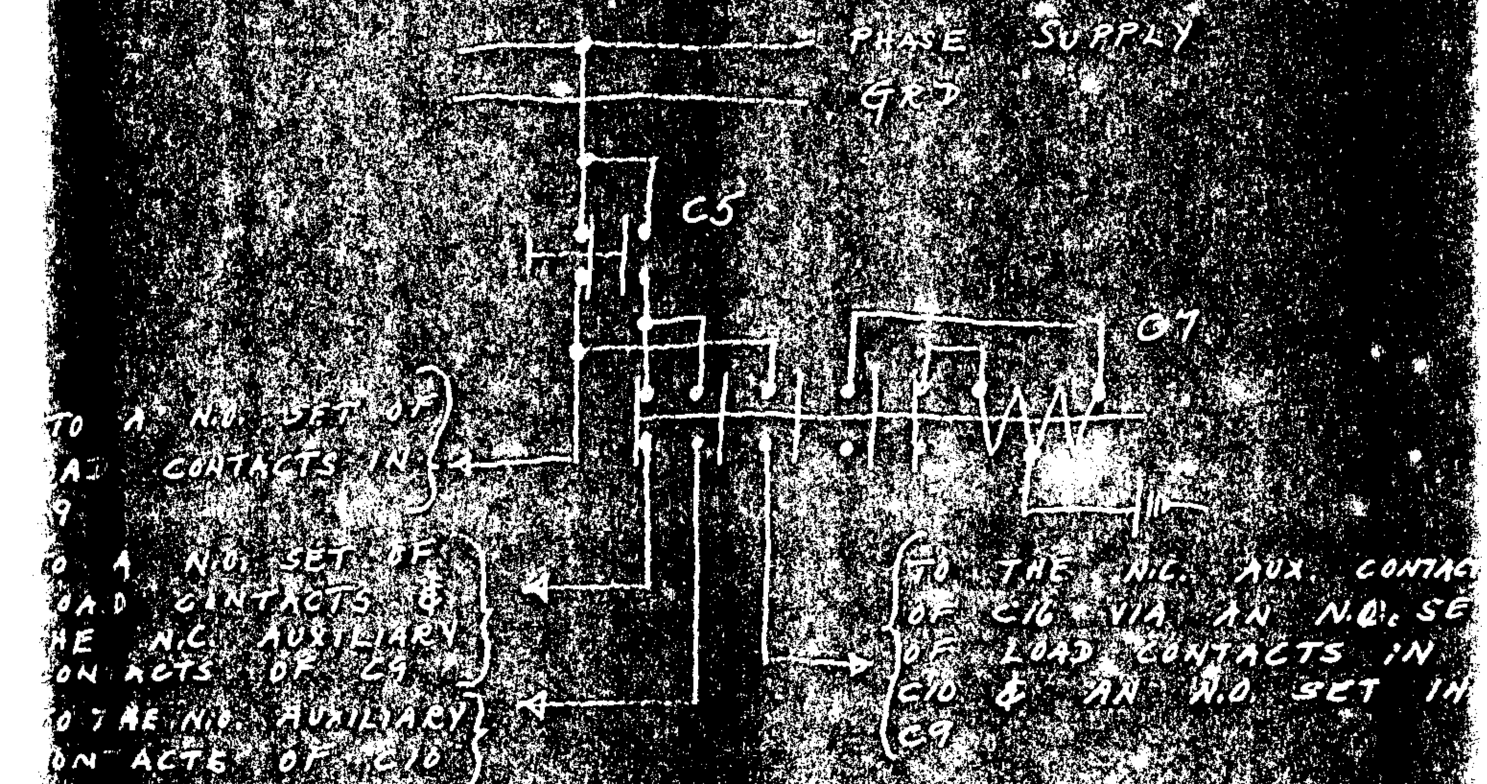
B. after C9 is engaged following the events mentioned in (A), C10 is engaged;

and,

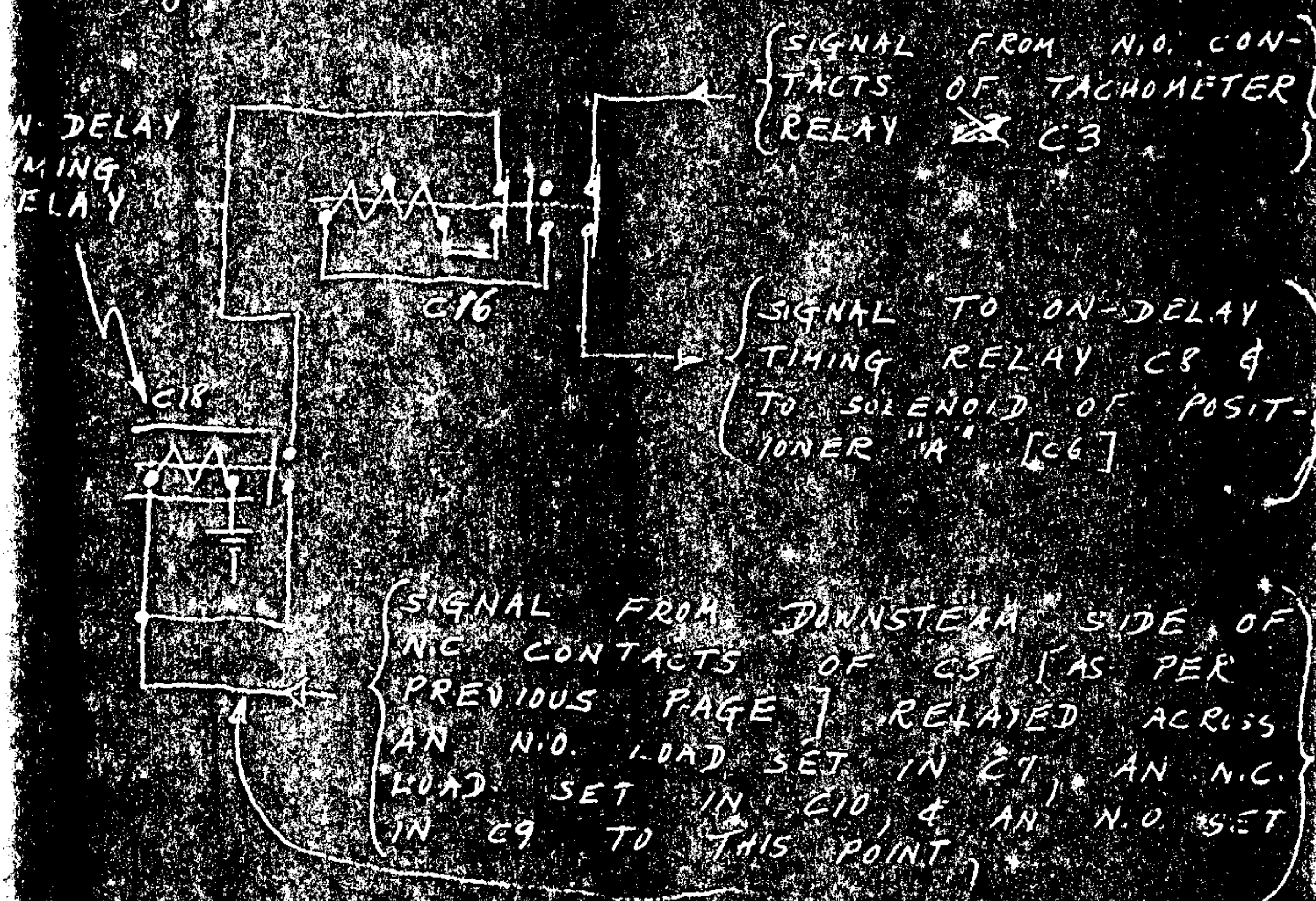
C. after C10 is engaged as a consequence of the engagement of C9 and after the ensuing motivation of Drum #2 alone results in the return of the latch-pawl to a position where it no longer trips the actuator of the Recruit Limit Switch, C7 is engaged.

Studying the Mirascope Control Circuit as given on Dwg. #9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal starting from plane supply, and after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the opened path, namely that C7 and C9 be engaged while C10 be disengaged, are fulfilled as a sequel to item (C) above. From pages 101-111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch C5. This signal which is transmitted across a normally-open set of load contacts in C7 to the normally-open set of auxiliary contacts in C10 occurs after the latch-pawl of Drum #2 has already mounted the approach block of Grab "B" during this Drum's travel towards its black-and-white viewing required position. It will also be found in the "Description...", pages 101-111, that the mounting of the approach block of Grab "B" by the latch-pawl member of Drum #2 is followed shortly thereafter by a blocking of the latch-pawl

in the grab-slot of Grab "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slat of Drum #2 with a clear slat in Drum #1 for the purpose of black-and-white viewing. Thus, since the signal which which engages C16 (and consequently disengages C6 [the solenoid of Positioner "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be ~~possible~~ practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This scheme is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-arresting action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. This means as well that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' would be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the drill-hole of Gimb "A". If this were done, then a way of doing it would be as indicated below:-



Of the matters raised on page 202, only one has thus far not been discussed, and this is Item (b), dealing with relay C15. On Sht #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg #9, it appears as a mechanically held relay. Two reasons underlie the change, of which the first is the more important:-

1. Sht #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C5, is transmitted across an N.O. load set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. load set in C12 to an N.O. set in C11, and, finally, is then applied to the plate-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, ^set^ C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color-viewing. However, since ~~C14~~ the engagement of C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement of C14, which would in turn lead to the secondary disengagement of C15 —— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg #9.

2. The second reason lies in the inadvisability of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. chatter and electrical disturbances to the operation of the TV circuit are possible. By making C15 a mechanically held relay, the permanent engagement of C15 prior to

the disengagement of C14 is assured; and, once, the engagement of C15 is established, it holds that engagement without any further feed of power. The latter fact satisfies the above-mentioned conditions that no member of the switching circuit be capable of "chattering" or demand a continued feed of power during any viewing cycle, other than — possibly — the Tachometer Relay.

As C15 is now specified, its engagement follows the completion of the drums-re-alignment action, for the engagement signal is transmitted along the following path:

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the latch-pawl of Drum #2 must be in its "low" position;

b) the signal as of (a) is relayed across a normally-open load set in C9, which means that C9 must be engaged — and this condition is satisfied since C9's position is reversed only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. load set in C9 to the upstream side of an N.O. set in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged as long as C2 is in its color-position and C15 is disengaged;

d) the signal as of (c) is applied from the downstream side of the N.O. set in C14 to the upstream side of an N.C. set in C12, which means that C12 must be disengaged for the further relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum # 2 is brought to a given state of 'lift' by the approach block of Grab "A"

and,

e) the signal as of (d) is relayed from the downstream side of the N.C. load set in C12 to an N.O. load set in C11, which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum # 2 past the departure block of Grab "B" during the travel of Drum #2 towards its color-realigned position with Drum #1, and further C11 maintains its engaged position until the next black-and-white viewing alignment is signalled.

The signal as of (e) is then applied to C15. Since the 'lift' of the latch-pawl by the approach block of Grab "A" imminently precedes the locking of Drum #2 into its color-alignment position with Drum #1, it follows that C15 is engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the Control Circuit given on Page 115, it would follow that C15 would ~~also~~ engage to release Positioner "B", disengage C14, and restore C9 and C7 to their disengaged positions, only after the color-alignment of the two drums has been achieved.

Thus Item (b) on Page 202 is explained!

TWO IMPORTANT CONSIDERATIONS:

Two important considerations underly the projected design of the Control Circuit. These are:-

a) the type of mechanically-held relay used

and b) the thinking behind the release of "Position "A"" after black-and-white alignment has been achieved.

It has been repeatedly set forth above that one of the functions served by the use of mechanically-held relays was to eliminate "chatter" and continuing electrical disturbances to the operation of the TV circuit where the functional demands on any given relay demands its continued engagement. This set of qualifications more or less defines the type of relay which is required. Explicitly, it would be required that:

1. the holding of the relay's engaged position be accomplished either by a mechanical or a magnetic latch

and 2. a second operating coil which overcomes the mechanical or magnetic latching action be a part of the relay.

Mechanical latches for the holding of relays in their engaged positions are extremely common, and, in fact, the name — mechanically held relay — is derived from the original use of such mechanical latches. More recently, it has been common to replace mechanical latches by permanent magnets which hold the relay-plunger once the plunger is drawn against the permanent magnet pole-face. The latter type of construction, which has been referred to as a magnetic latch, is preferred here, since strictly mechanical latches are subject to improper operation when the baseboards to which they are attached are jarred.

Finally as regards the mechanically held relays used, it should be observed that to assure the best operation of such a relay, the two operating coils of the relay —— the one which acts to engage the relay, and the other which acts to disengage or de-latch the relay —— should be signalled thru auxiliary contacts which are operated in common with the load contacts. The contacts which are auxiliary to the engaging action — the N.C. auxiliary contacts — should have a "dragging effect" incorporated in them to assure the completion of the engaging stroke against a spurious or chattering "making" action.

If the construction schedule for the models permits, I will design a set of relays suited in size and other characteristics to the demand of the Control Circuit.

On the subject of the decision to disengage Positioner "A" after black-and-white alignment of the Drum has been achieved, it has been held here that the inertia of the Drum Assembly and the Drive Motor rotor, plus the friction forces between the gears constituting the power transmission, would be sufficient to hold any previously established position once the desired Drum Assembly alignment and positioning in front of the cabinet window has been achieved. The further argument that a continued energizing of the Positioner solenoid might lead to chattering and also to electrical disturbances to the T.V. circuit's normal operation led to one of two solutions :-

A. either construct the Positioner solenoids along mechanically-held lines*,

or,

B. hold any given Drum Assembly position on the basis of the inertia and friction forces named above.

The latter was chosen for the reason of the costs involved in the former alternative.

* NOTE:- With regard to item (A), see Page 204 and 205

ERRATA, ADDENDA, & COMMENTS

RE:- PAGES 101-111

* * * * * * * * * * * * * *

IMPORTANT

[NOTE:- Check relay C9 on Dwg. #9. The set of contacts in C9 delivering phase supply to the Drive Motor should be a normally-closed set. If Dwg. #9 indicates otherwise, it should be revised in this regard.]

* * * * * * * * * * * * * *

DIFFERENCES BETWEEN THE ORIGINALLY-SUBMITTED CONTROL CIRCUIT & THE ONE GIVEN ON DWG. #9:-

A proposed control circuit for the Mirrascope was submitted as Sheet #19 of the original group of sketches, and, this originally-submitted Control Circuit was the basis of the document, pages 101-111, entitled "Description of the Drum Alignment Control Circuit". Since the "Mirrascope Control Circuit" as submitted on Dwg. #9 differs in some respects from that given on Sheet #19, the descriptive material given on pages 101-111 will not correspond exactly to the facts of the latterly-submitted circuit. Therefore, this document is submitted to amend and correct pages 101-111 wherever this is required.

The "Mirrascope Control Circuit" as given on Dwg. #9 differs from that given on the above-mentioned Sht. #19 in the following principal respects:-

a) (On Dwg. #9,) the signal from the downstream side of the normally-open set of load contacts in the Tachometer Relay C3 is passed to the timing relay C8 and to the solenoid coil of

Positioner "A" via a normally-closed set of load contacts in the mechanically-held relay C16; while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay, while on Sht. #19 it appears as a conventional relay;

c) on Dwg. #9, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 3 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.C. unit, and C7 as 1 N.O. - 1 N.C. unit;

and,

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (a) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the Drums for "black-and-white" viewing has been achieved. By so doing, any A.C. chatter associated with the continued engagement of C6 [the solenoid member of Positioner "A"] and C8 [the on-delay timing relay] is eliminated, and, further, any disturbing effects due to ~~the~~ a continued feeding of these equipment items is eliminated.

Associated with the addition of C16 to the "black-and-white alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specifications for C9. From a reading of pages 101-111, it will be observed that -

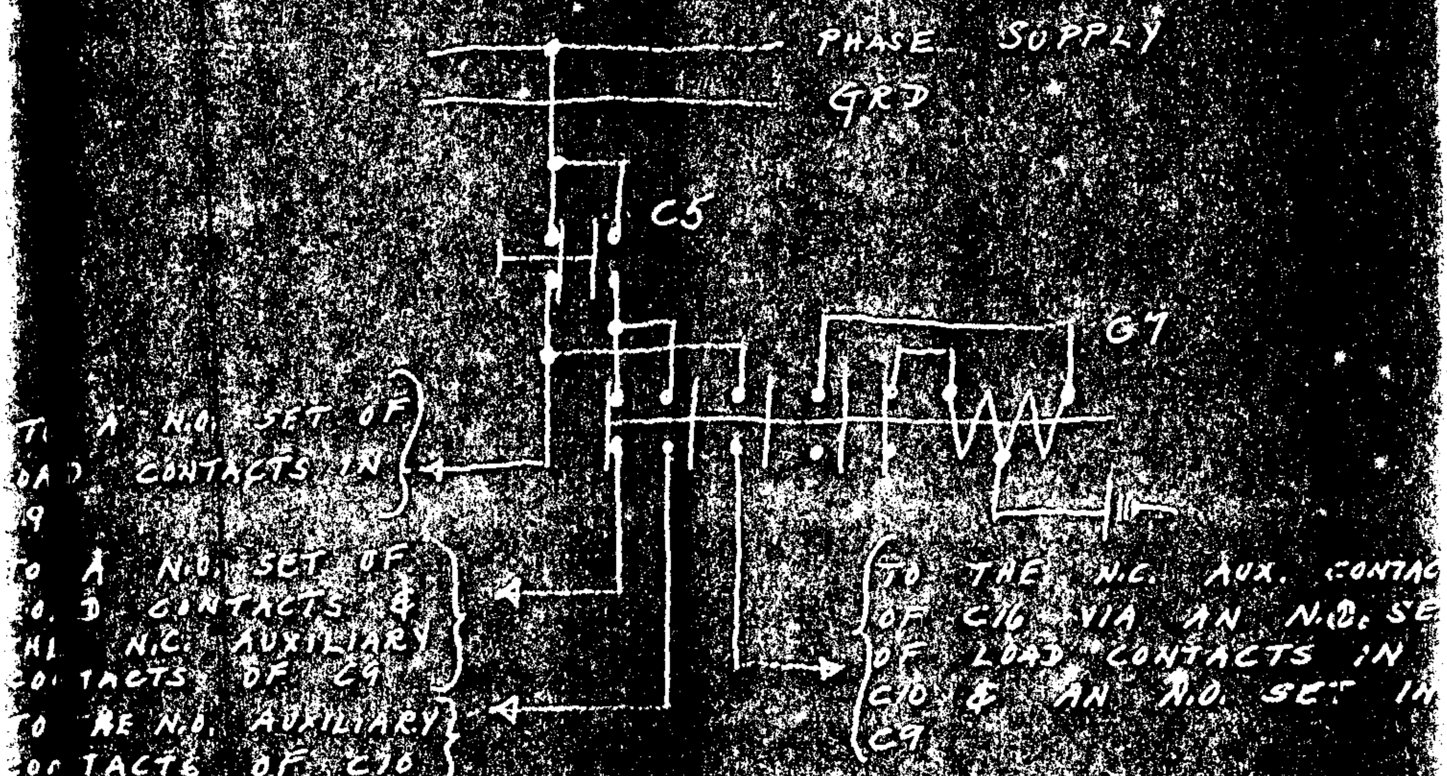
A. when the arresting of the Drum Assembly and the disengagement of the latch-pawl from Grab "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing, C9 is engaged;

B. after C9 is engaged following the events mentioned in (A), C10 is engaged;

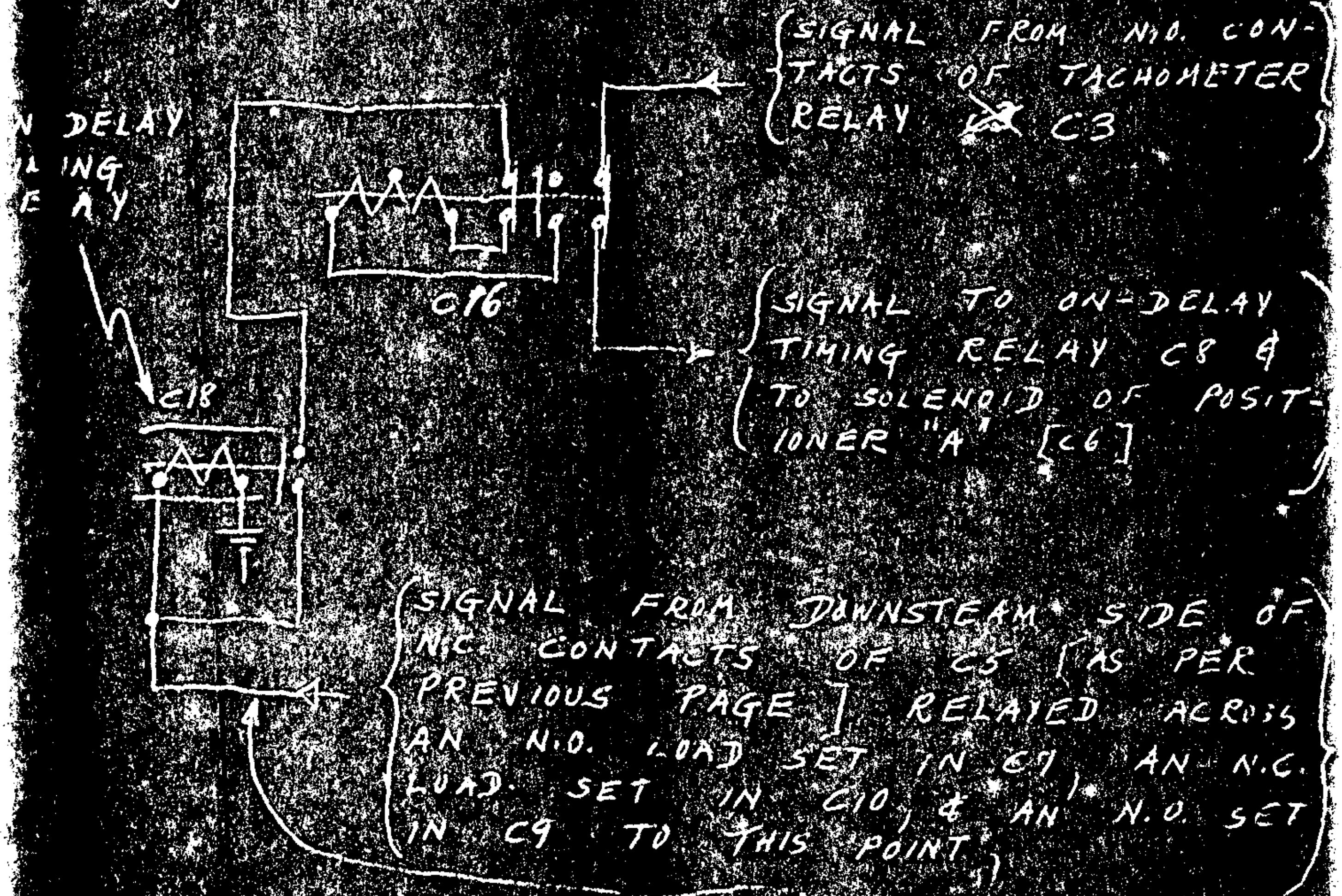
and, C. after C10 is engaged as a consequence of the engagement of C9 and after the ensuing motivation of Drum #2 alone results in the return of the latch-pawl to a position where it no longer trips the actuator of the Peanut Limit Switch, C7 is engaged.

Studying the Mixiscope Control Circuit as given on Dwg. #9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal starting from phase supply, and, after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the opened path, namely that C7 and C9 be engaged while C10 is disengaged, are fulfilled as a sequel to Item (C) above. From pages 101-111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch C5. This signal which is transmitted across a normally-open set of load contacts in C7 to the normally open set of auxiliary contacts in C10 occurs when the latch-pawl of Drum #2 has already surmounted the approach block of Grab "B" during the Drum's travel towards its black-and-white viewing required position. It will also be found in the "Description....", pages 101-114, that the surmounting of the approach block of Grab "B" by the latch-pawl member of Drum #2 is followed shortly thereafter by a locking of the latch-pawl

in the grab-slot of Grab "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slat of Drum #2 with a clear slat in Drum #1 for the purpose of black-and-white viewing. Thus, since the signal which which engages C16 (and consequently disengages C6 [the solenoid of Positioner "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be ~~possible~~ practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This scheme is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-arresting action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. This means as well that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' would be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the drill-hole of Grab "A". If this were done, then a way of doing it would be as indicated below:-



Of the matters raised on page 202, only one has thus far not been discussed, and this is Item (b) dealing with relay C15. On Sht #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg. #9, it appears as a mechanically-held relay. Two reasons underlie the change, of which the first is the more important:-

1. Sht #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C5, is transmitted across an N.O. load set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. load set in C12 to an N.O. set in C11, and, finally, is then applied to the place-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, that C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color-viewing. However, since ~~C14~~ the engagement of C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement of C14, which would in turn lead to the secondary disengagement of C15 —— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg. #9.

The second reason lies in the inadvisability of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. chatter and electrical disturbances to the operation of the TV circuit are possible. By making C15 a mechanically held relay, the permanent engagement of C15 prior to the disengagement of C14 is secured; and, once, the engagement of C15 is established, it holds that engagement without any further feed of power. The latter fact satisfies the above-mentioned conditions, that no member of the switching circuit be capable of "chattering" or demand a continued feed of power during any viewing cycle, other than — possibly — the Jackmotor Relay.

As C15 is now specified, its engagement follows the completion of the drums-re-alignment action, for the engagement signal is transmitted along the following path:-

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the latch-pawl of Drum #2 must be in its "low" position;

b) the signal as of (a) is relayed across a normally-open load set in C9, which means that C9 must be engaged — and this condition is satisfied since C9's position is revised only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. load set in C9 to the upstream side of an N.O. set in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged as long as C2 is in its rotor-position and C15 is disengaged;

d) the signal as of (c) is applied from the downstream side of the N.O. set in C14 to the upstream side of an N.C. set in C12, which means that C12 must be disengaged for the further relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum # 2 is brought to a given state of 'lift' by the approach block of Grab "A"

and,

e) the signal as of (d) is relayed from the downstream side of the N.C. load set in C12 to an N.O. load set in C11, which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum # 2 past the departure block of Grab "B" during the travel of Drum # 2 towards its color-realigned position with Drum # 1, and further C11 maintains its engaged position until the next black-and-white sleeving alignment is signalled.

The signal as of (e) is then applied to C15. Since the 'lift' of the latch-pawl by the approach block of Grab "A" imminently precedes the locking of Drum # 2 into its color-alignment position with Drum # 1, it follows that C15 is engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the Control Circuit given on Page 115, it would follow that C15 would thus engage to release Positioner "B", disengage C14, and restore C9 and C7 to their disengaged positions, only after the color-alignment of the two drums has been achieved.

Thus item (b) on Page 202 is explained!

TWO IMPORTANT CONSIDERATIONS:

Two important considerations underly the projected design of the Control Circuit. These are:-

a) the type of mechanically-held relay used

and b) the thinking behind the release of Positioner "A" after black-and-white alignment has been achieved.

It has been repeatedly set forth above that one of the functions served by the use of mechanically-held relays was to eliminate chatter and continuing electrical disturbances to the operation of the TV circuit where the functional demands on any given relay demands the continued engagement. This set of qualifications more or less defines the type of relay which is required. Explicitly, it would be required that:-

1) the holding of the relay's engaged position be accomplished either by a mechanical or a magnetic latch

and, 2. a second, operating coil which overcomes the mechanical or magnetic latching action be a part of the relay.

Mechanical latches for the holding of relays in their engaged positions are extremely common, and, in fact, the name — mechanically held relays — is derived from the original use of such mechanical latches. More recently, it has been common to replace mechanical latches by permanent magnets which hold the relay plunger once the plunger is drawn against the permanent magnet pole-face. The latter type of construction, which has been referred to as a "magnetic latch", is preferred here, since strictly mechanical latches are subject to imperfect operation when the baseboards to which they are attached are jarred.

Finally as regards the mechanically-held relays used, it should be observed that to assure the best operation of such a relay, the two operating coils of the relay — the one which acts to engage the relay, and the other which acts to disengage or de-latch the relay — should be signalled thru auxiliary contacts which are operated in common with the load contacts. The contacts which are auxiliary to the engaging action — the N.C. auxiliary contacts — should have a 'dragging effect' incorporated in them to assure the completion of the engaging stroke against a spurious or chattering 'making' action.

If the construction schedule for the models permits, I will design a set of relays suited in size and other characteristics to the demand of the Control Circuit.

On the subject of the decision to disengage Positioner "A" after black-and-white alignment of the Drum has been achieved, it has been held here that the inertia of the Drum Assembly and the Drive Motor rotor, plus the friction forces between the gears constituting the power transmission, would be sufficient to hold any previously established position once the desired Drum Assembly alignment and positioning in front of the cabinet window has been achieved. The further argument that a continued energizing of the Positioner solenoid might lead to 'chattering' and also to electrical disturbances to the T V circuit's normal operation led to one of two solutions :-

A. either construct the positioner solenoids along mechanically-held lines,

or,

B. hold any given Drum Assembly position on the basis of the inertia and friction forces named above.

The latter was chosen for the reason of the costs involved in the former alternative.

* NOTE - Well argued to Drum (A), see Pages 204 and 205

(in continuation)

onto the departure block of Grab "B"; (b) a gliding of the latch-pawl down the slope of the departure block; and, (c), in consequence of (b), a return of C5's actuator to its normal position.

With the return of C5's actuator to its normal position, a signal would be caused to course from phase-supply across the normally-closed set of contacts of C5, and then across a normally-open set of contacts in the still-engaged relay C9, to one of the normally-open sets of contacts of C14.

C14, it will be recalled, like C13, remains engaged so long as C2 is in the "color" position and C15 is not engaged. Therefore, the signal originating at the normally-closed set of C5's contacts is relayed across the indicated normally-open set of contacts in the now-engaged C14 to pass across a normally-open set of load contacts in the now-engaged C12, and appears finally at the upstream-side of the normally-closed set of auxiliary contacts of C11. Here, the signal results in the engagement of C11.

The engagement of C11, by the closing of its normally-open ~~load~~ load contacts opens a path for a succeeding signal from the normally-open set of contacts in C5 to be applied to the normally-open set of auxiliary contacts in C12. Thus, when Drum #2, during the completion of the travel which is initiated when C12 engages, causes the latch-pawl to mount the approach block of Grab "A", the actuator of C5 is tripped and a signal is caused to course from the downstream side of the normally-open contacts of C5 across the normally-open set of load contacts in the still-engaged C7, and then across a normally-open set of load contacts in the still-engaged C9, to the upstream side of one of the normally-open sets of contacts of the conventional relay C14. Since C14 is still engaged, this signal is then relayed across a normally-open set of load contacts in C11 to wind up ultimately at the upstream-side of the normally-open set of auxiliary contacts of C12. The application of the signal to the mentioned set of auxiliary contacts causes an energizing of the disengaging section of the operating coil of C12, and a resultant disengagement of C12. Accordingly, the power signal to the drive-motor is interrupted, and, in net effect, the motor is disengaged just as the latch-pawl mounts the ~~up~~ slope of the approach block of Grab "A". The engagement of the latch-pawl in Grab "A"'s grab-slot is then accomplished on the basis of the residual momentum of Drum #2

SENDING THE COLOR-VIEWING-ALIGNED DRUMS INTO ACTION:-

Once the latch-pawl drops into Grab "A"'s slot, the actuator member of C5 returns to its normal position, and, with C12 in its now-disengaged position and C11 in its still-engaged position, a path is opened for a signal from the downstream side of the normally-closed set of contacts of C5 to the operating coil normally-closed set of auxiliary contacts of the mechanically-held relay C15. The application of the mentioned signal to the normally-closed set of auxiliary contacts of C15 leads to the engagement of C15. The signal which accomplishes this task proceeds from the downstream side of the normally-closed contacts of C5 across a set of normally-open contacts in the still-engaged relay C9 to the upstream side of a normally-open set of contacts in the conventional relay C14. From this point, it travels across the mentioned set of contacts in the still-engaged C14 to a normally-closed set of contacts in the now-disengaged mechanically-held relay C12, from which point it is relayed to a normally-open set of load contacts in the still-engaged C11. The still-engaged C11 permits the mentioned normally-open set of load contacts to convey the thus-relayed signal to the upstream-side of the normally-open set of auxiliary contacts of the mechanically-held relay C15. As indicated above, the eventual travel of the signal to the normally-closed set of auxiliary contacts of C15 leads to the energizing of the engaging section of the operating coil of C15, and hence to the engagement of C15.

For its part, the thus-accomplished engagement of the mechanically-held relay C15 leads to:-

a) the application of a maintained and continuous energizing signal to the Drive Motor

b) the discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14

and, c) the sending out of a "disconnect signal" to C9 and C7

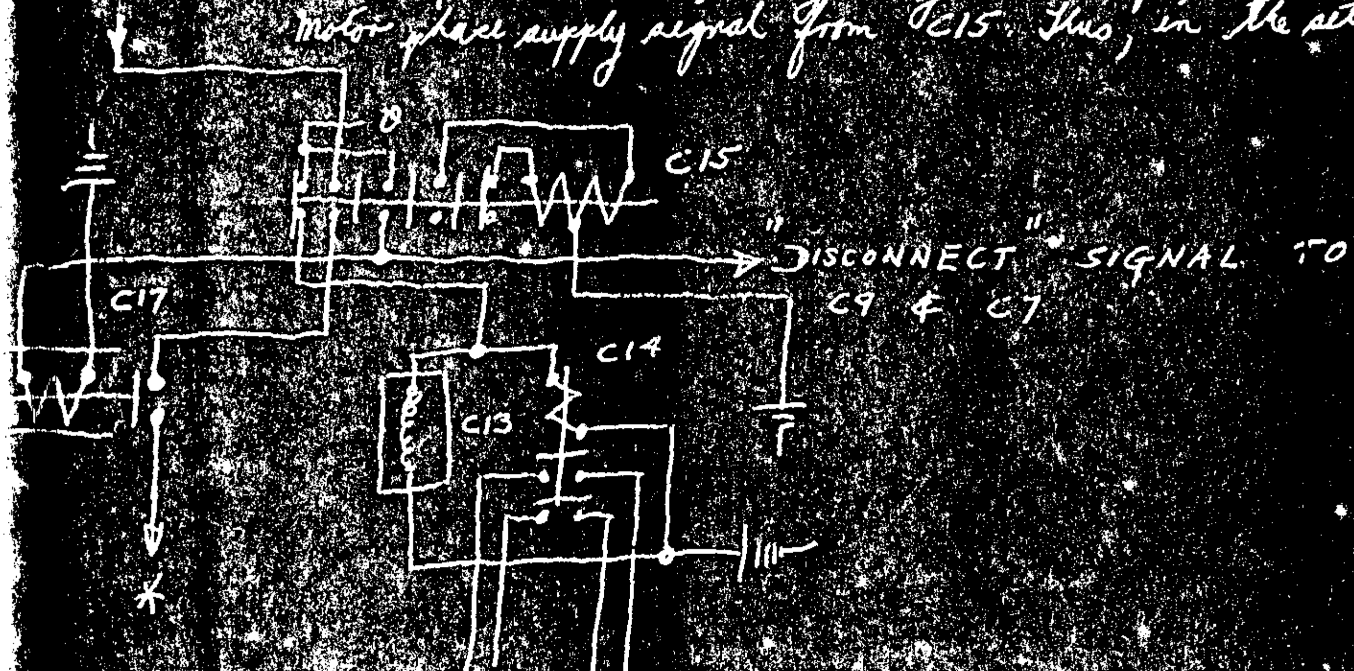
The discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14 according to (b) above takes place via the opening of the normally-closed set of load contacts in C15 when C15 is engaged. The discontinuation of phase supply to C13, the solenoid member of Positioner "B", means the retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B". This retraction of the plunger-member (see Dwg #9) takes place under the action of the recoil spring member of the Positioner assembly. The retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B" clears the impediment to the Drum Assembly's going into action which the energized Positioner constitutes. The simultaneous discontinuation of phase supply to ~~Positioner "B"~~ the conventional relay C14 means the de-energizing of C14, and the breaking of the paths whereby the 'activating' signals for C11 and C12 are transmitted.

The application of a maintained and continuous energizing signal to the Drive Motor according to Item (a) above is accomplished by the 'making', or closing, of a normally-open set of load contacts in C15 when C15 engages. As noted above, since the plunger-member of Positioner "B" is withdrawn from the drill-hole member of Grab "B" simultaneously with the application of the energizing signal to the Drive Motor, both conditions for the sending of the Drum Assembly into action are accomplished with the engagement of C15:-

1. the plunger-member of Positioner "B" as a holding agency against rotation of the Drum Assembly is removed

and: 2. the continuous power supply for the Drive Motor which is required for its operation in color-viewing is supplied.

NOTE:- The simultaneity of action which C15 establishes between the retraction of the plunger of C13 and the energizing of the Drive Motor raises the question as to whether a slowness of the recoil action of plunger assembly would not result in a jamming of the plunger in the drill-hole of Grab "B" and a possible consequent stalling of the motor. To forestall such an eventuality, it might be best to place a time-delay relay in the path of the motor phase supply signal from C15. Thus, in the set-up



shown below, the on-delay timing relay C17 would delay the application of the energizing signal to the Drive Motor for a sufficient period of time to guarantee the retraction of Positioner "B"'s plunger from the drill-hole of Grab "B", thereby eliminating of questions of jamming of the plunger or stalling of the motor.

Now, let us return Item (C) above, namely the 'disconnect' signal to C7 and C9. [NOTE:- Observe that in the sketch given above a 'tap' off the signal to C7 and C9 is used to activate the on-delay timing relay C17]. By its very nature, the 'disconnect' signal to C7 and C9 is a 'clear-the-board' signal which readies the "black-and-white alignment" section of the control circuit for its next call to action. This 'disconnect' or 'clear-the-board' signal is accomplished via the closing of a normally-open set of load contacts in C15 when C15 is engaged.

In connection with the 'clear-the-board' signal from C15 to C7 and C9, it might be well to point out that a 'clear-the-board' signal for the case of the mechanically-held relay C16 is provided via a 'tap' from the color-position contact of the 2-position selector switch C2. Thus when the 2-position selector switch C2 is turned to its color-position, C16 is 'cleared' for its next service in the functioning of the "black-and-white alignment" section of the control circuit. No activation of any portion of the "black-and-white alignment" section of the control circuit follows from this since the turning of the selector switch C2 to its color-position perforce removes phase supply from the "black-and-white alignment" section of the circuit.

Finally, it should be observed that the clear-the-board signal for the "color-alignment" section of the circuit [in particular for the C15 and C11 components thereof] is obtained by a 'tap' from the black-and-white position of the 2-position selector switch C2. Thus, simultaneously with the next calling of the 'black-and-white' alignment section of the circuit into action, the rotor-alignment section of the control circuit is readied for its next call to duty.

DWG. #8

1. 3/4" x 3/4" x 1/16" aluminum angle ring — (also see Item "JB")
2. See Item "JB"
3. " " "
4. Anchor gussets for the "support members" as per Dwg. #1

X. (See Items "JD", both views)

5. 3/4" x 3/8" x 1/8" aluminum angle spokes — (also see Items "JB" and "JC")
6. Nice 1600 Series 1 13/16" shaft-size double-sealed single row ball bearing
7. 1/16" Pl aluminum coverplate
8. 1/8" Ø x 3/8" lg. rd. hd. machine screws - 6 req.
9. aluminum hub member (machine from solid round or tube stock)
10. 1/8" Ø x 1 1/4" lg. capscrew and bolt - 2 req. (See Item "JD" - Plan View)
11. mild steel support axle
12. 1/8" Pl aluminum anchor gussets, welded as shown to the rim — 6 equi-spaced sets req.
13. shank of support axle — see Dwg. #1 for members completing the "support"
14. hole for cotter pin
15. 1 1/4" x 1 1/4" x 1/16" aluminum angle rim of Outer Drum L.H. End-Ring
16. hole for the entry of Positioner "B"'s plunger into Grab "B"; hole is to be 3/8" Ø at its innermost and smallest point with the peripheral metal being bevelled off as indicated to give a larger "target" for the plunger.

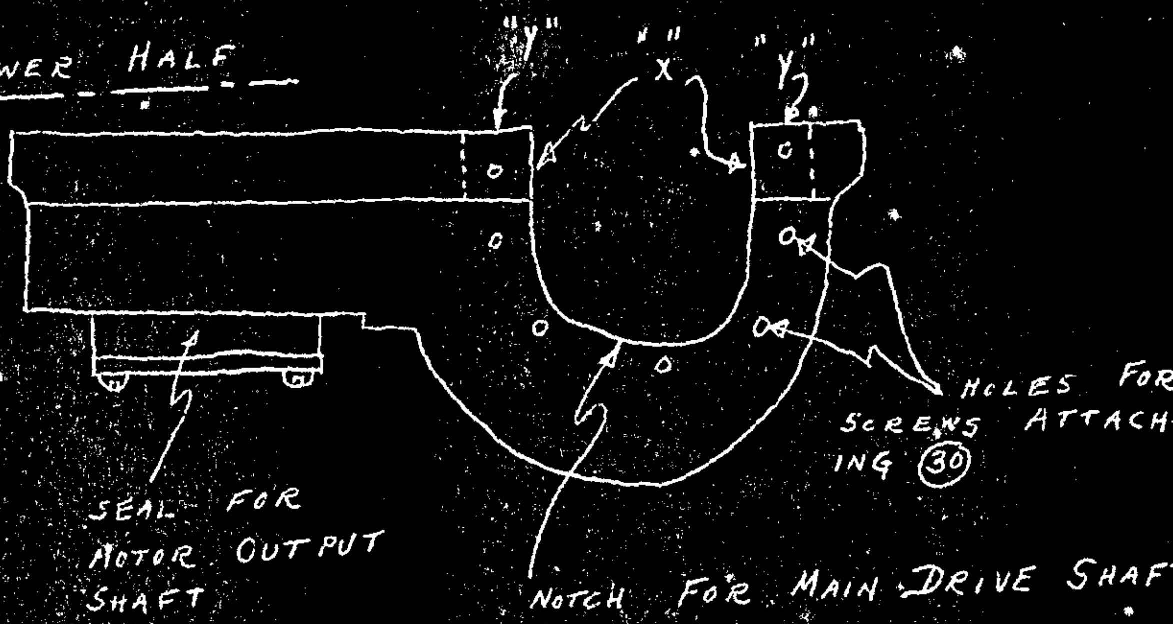
7. departure Hole member of Grab "B"

8. filter slot [NOTE:- In the immediate region of the hole member

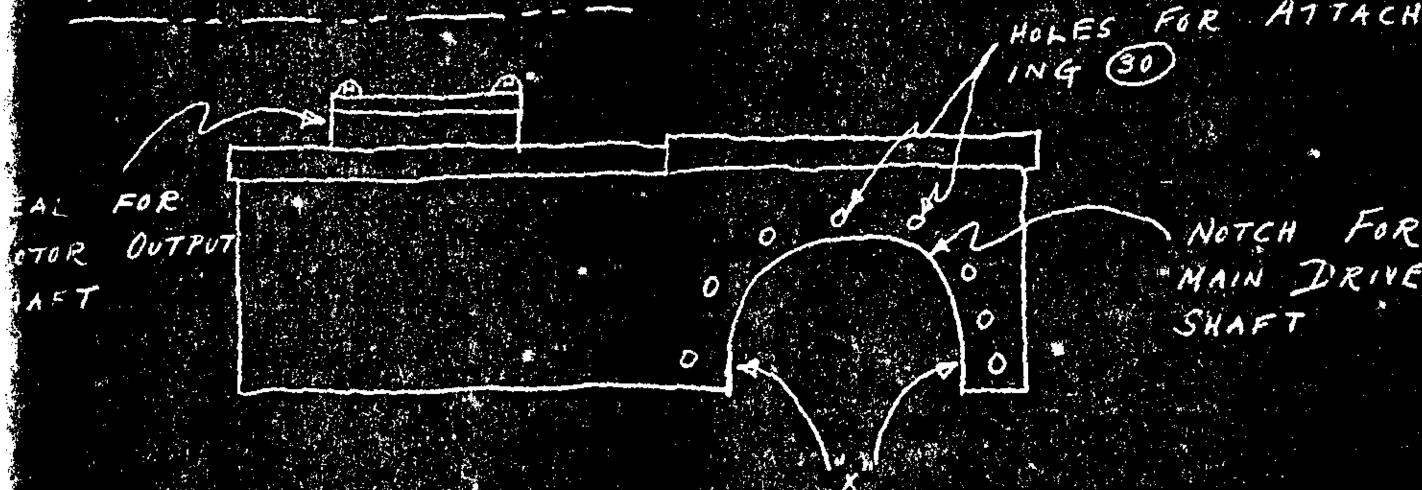
the filter slat is to be notched to permit the plunger a certain lattitude in going "home" without incurring the risk of mechanical injury to the slat. The dotted-line extension of the filter slat as indicated in this detail shows the extent to which each slat covers the End-Ring for the balance of the Ring. For the indicated portion of the Ring, the dotted-line therefore shows the extent to which notching of the slat is projected. In the circumferential direction (girth direction), a ½" distance between the hole perimeter and the nearest portion of the notched slat is proposed.

19. The members labelled (19), when connected by brazing or welding as indicated, will form the "top portion" or "top half" of the Gear Housing. [NOTE:- The Gear Housing is composed of two halves:- an 'upper half' into which the members marked (19) enter; and, a 'lower half' into which the members marked (25) enter. The 'lower-half' is flared, as indicated in the Section Elevation View, to form a "female" at its top rim; while the bottom rim of the 'upper-half' forms the "male" member of the joint. The joint should be friction-tight at all points, or should be caulked or felt-lined to achieve a reasonable degree of tightness. Both halves should be notched to permit their sliding over (27), the main drive shaft of the assembly. The so-notched sections, with the principal portions of the notches following the contours of (27), would, when assembled, form round openings about (27) with a minimum clearance from (27). These openings are then sealed by "thick" felt seals (31) pressed "home" against both halves by retainer rings (30). In Side Elevation Views, the halves would then appear as indicated approximately below:-

THE LOWER HALF



THE UPPER HALF:-



NOTE:- The immediate portions of the notches to which "x" points is in each case a straight line tangent to the circle described by the balance of each of the notches.

"Y", in the case of the lower half, indicates regions in which the flash is eliminated to accomodate the members 30 and 31, and enable effective sealing.

Both halves of the Housing to be made of 24 gage sheet steel galvanized.

DWG. #8

20. Mild Steel Coverplate
21. Drive Motor Output Shaft
22. $\frac{1}{16}$" ⌀ x $\frac{3}{16}$" lg. rd. hd. mach. screws – 6 req.
23. $\frac{1}{16}$" thk. felt rings, 4 per seal, compressed to form $\frac{3}{16}$" thick seal
24. 18 gage sheet steel legs for housing — size and shape to convenience
25. The members labelled (25) taken together form the 'lower-half' of the Housing. See (19)
26. Driven Gear Member of Helical Gear Train
27. Main Drive Shaft ($1\frac{3}{16}$" ⌀ at the seal points)
28. Constantly-Maintained Oil Level
29. $\frac{1}{16}$" ⌀ x $\frac{1}{4}$" lg. rd. hd. mach. screws (12 per retainer ring), to screw into snugly-fitting holes in Housing wall
30. $1\frac{5}{8}$" O.D. x $1\frac{1}{4}$" I.D. x $\frac{1}{16}$" thk mild steel retainer rings containing 12 equi-spaced holes drilled and tapped on a $1\frac{7}{16}$" ⌀ hole circle
31. 2 – $\frac{1}{16}$" thk. felt rings $1\frac{1}{8}$" I.D. x $1\frac{5}{8}$" O.D. superimposed on one another to form a thk. felt seal
32. $\frac{1}{8}$" x $\frac{1}{8}$" x $\frac{3}{8}$" lg. steel key between the Main Drive Shaft and the driven gear.
33. The driving gear

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/27/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained John D. Walker

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

146. Photostatic copy of papers entitled "Notes".

80A

100-95068-1B

NOTES

[illegible]

DRIVE MOTOR ARRANGEMENTS

THE C.B.S. SYSTEM:-

The system employed by C.B.S. to maintain synchronization of the color disc, to match the output signal from a magnetic structure which [illegible] in coordination with the color wheel against the vertical P-P [illegible] of the color receiver. The matching operation which takes place in the phase detector (discriminator or comparator) section of a servo-mechanism results in the application of the out-of-balance voltage or D.C. output of the discriminator is applied to the grid of a tube feeding a saturable reactor, and the saturable reactor in turn controls the voltage applied to an induction motor driving the color wheel. The servo-mechanism is conventional in its principles as well as its details of design. Like all servo-mechanisms it consists of a) a discriminator section, b) an anti-hunt section to provide for the stability of the servo itself against undue [illegible] [illegible] about a control point, c) a power output or control [illegible] section which translates the out-of-balance output [illegible] discriminator into a signal operating the control mechanism [illegible] mechanism itself. The magnetic structure which [illegible] [illegible] or stator device develops the output [illegible] [illegible] inductor [illegible] arising from the periodic [illegible] [illegible] [illegible] rotating magnet, with [illegible] on the color wheel or [illegible] other portion of [illegible] to the [illegible] that the [illegible] speed is [illegible]

[illegible] [illegible] [illegible] it must also be [illegible] [illegible] principle [illegible] the driving induction [illegible] [illegible]. Fundamentally the [illegible] [illegible] [illegible] characteristic of an induction motor at any given output torque and applied voltage.

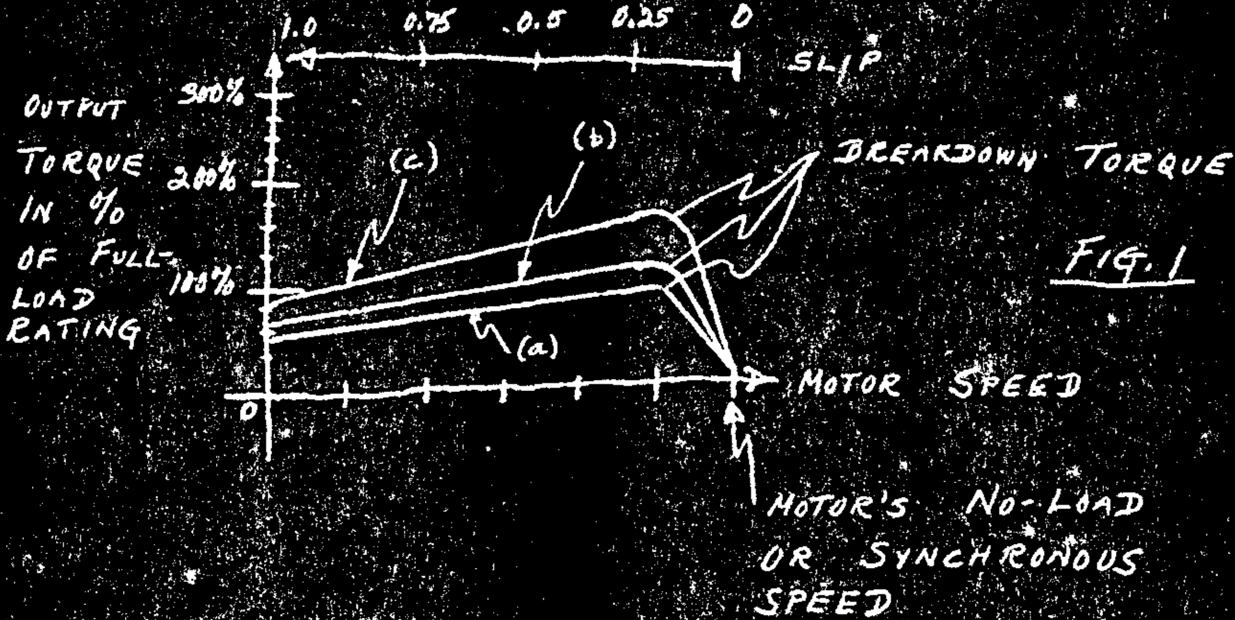


FIG. 1

Fig. 1 will illustrate the thought projected immediately above. Curves (a), (b), and (c) indicate generally the speed-torque (and/or torque-slip) relationships for a polyphase induction motor where (a) holds for the lowest of three highly fixed applied voltages, (b) for an intermediate value, and (c) for the highest. If the motor is suitably within range of its designed task, then only that portion of each curve which lies between the full-load speed and the no-load speed of the motor is of interest. [NOTE:- The full-load speed of the motor is that speed ~~which corresponds to the~~ point nearest the no-load speed at which the output torque of the motor most efficiently approximates the theoretical torque at the given input (given voltage) condition. Roughly speaking, this means that only that portion of each curve which lies to the ~~left~~ right of the intercept of the breakdown torque with the motor speed axis is of interest.] In each of the cases of curves (a), (b), and (c), it is clear that, in the indicated region of interest, the motor's speed is a highly defined function of the output torque of the motor.

Thus, at a given applied voltage, the motor will operate at such a constant speed as is determined by the torque which it is called on to deliver.

If we were now to draw a vertical line thru any given speed lying between the motor's full-load speed and its no-load speed, and if this vertical line were to intercept each of curves (a), (b), and (c), it is clear that to obtain the arbitrarilly chosen speed, it would be necessary to do either of two things:-

a) we might adjust the input conditions to the motor (the applied voltage to the motor) to obtain some speed vs. torque curve on which the required torque corresponds to the chosen speed.

or

b) one might adjust the driven machine so that at any arbitrarilly chosen input condition to the motor, the required torque output corresponds to the desired constant speed.

In brief, the problem in driving the color wheel or the color drum portion of a CBS color receiving unit is to establish and hold a given constant speed to a high level of accuracy and stability. The induction motor lends itself to such a service, to constant speed service, if the input conditions to the motor are "matched" to its required output torque, — or if the required output torque is closely regulated to a fixed input condition. CBS in its system chooses the former of the two possible alternatives, and establishes the required constant speed by adjusting the input conditions to the motor in such a fashion that the required output torque vs speed curve is achieved.

In doing this, it employs a servo-mechanism operating a saturable reactor as the means of adjusting the input conditions (the voltage applied) to the motor.

"SOME POSSIBLE NON-SERVO MECHANISMS":-

of the set In this class, some (6) alternatives have been offered :-

[margin: …en the required 48-cycle A.C. is obtained by a 2-step conversion from the 144-cycle vertical pulse …ong a multi-vibrator and an amplifier … the … components of the 2-step conversion system]

A. a system which provides for the feeding of a 48-cycle A.C. current to a 60-cycle, 4-pole, (1800 rpm) synchronous motor as a means of obtaining a constant output speed which is $\frac{48}{60}$ of 1800 (i.e. 1440 rpm);

[margin: …en the required 144-cycle A.C. is obtained by a 1-step conversion from the 144-cycle vertical pulse of the set. An amplifier constitutes the 1-step conversion system]

B. a system which provides for the feeding of a 144-cycle A.C. current to a 60-cycle, 12-pole (600 rpm) synchronous motor as a means of a constant output speed which is $\frac{144}{60}$ of 600 (i.e. 1440 rpm);

[margin: …e the required 60-cycle A.C. is obtained by a 3-step conversion from the 144-cycle vertical pulse of the set. Two multi-vibrator circuits and … amplifier section … the conversion system]

C. a system which provides for the feeding of a 60-cycle A.C. current to a 60-cycle, 4-pole (1800 rpm) synchronous motor as a means of obtaining a constant 1800 rpm output which is then "geared down" mechanically to 1440 rpm;

D. a system as per (A) except that the 48-cycle color pulse forms the base of the 48-cycle A.C. generating system;

E. a system as per any of (A), (B), (C) or (D) as regards the A.C. feed to a synchronous motor

but in which the synchronous motor works [as]
part of a tandem arrangement with an indu[ction]
motor, with the synchronous motor supplying s[ome]
a part of the start and run energy requirem[ents]

and,

F. a system as per (A), (B), (C), or (D) as regard[s]
generating of an A.C. feed to a synchronous m[otor]
as per (E) so regards a tandem arrangement
an induction motor but in which the two moto[rs]
built into a common frame.

Each of the systems listed above have the following in comm[on]
(a) they propose a "lock" to a powerful and highly accurate si[gnal]
[the 144-cycle vertical pulse in (A), (B) and (C), and the 48-[cycle]
color pulse in (D)] and, in fact, a signal which gate[s]
picture-projection of the set; and, (b) they lodge the pha[se]
detection or discrimination functions of the CBS servo-mech[anism]
in the functional properties of a synchronous motor.

THE NOW-PROJECTED IDEA:-

The now-projected idea goes back to the use of an indu[ction]
type motor as the Driver for a color-wheel or color-drum. [It has]
already been indicated [Pages (2) and (3), — in particular (3)] [that]
an induction motor lends itself to constant speed service if eith[er]
the conditions be imposed. The choice here goes to that a[s]
listed under Item (b) ~~.....~~ on Page (3).

Let us suppose that as a primary condition, the m[otor]
is selected to drive a given color wheel or color drum [as]
per the normal and usual design procedure, 10-25% [over]
size, and that therefore its operating speed at standa[rd]
supply voltage would lie somewhere between its full-loa[d]
and its no-load speed. This condition would be ind[...]

but in which the synchronous motor works as part of a tandem arrangement with an induction motor, with the synchronous motor supplying only a part of the start and run energy requirements;

and,

F. a system as per (A), (B), (C), or (D) as regards the generating of an A.C. feed to a synchronous motor and as per (E) as regards a tandem arrangement with an induction motor but in which the two motors are built into a common frame.

Each of the systems listed above have the following in common:- (a) they propose a "lock" to a powerful and tightly accurate signal [the 144 cycle vertical pulse in (A), (B) and (C), and the 48-cycle color pulse in (D)] and, in fact, a signal which gaits the picture-projection of the set; and, (b) they lodge the phase detection or discrimination functions of the CBS servo-mechanism in the functional properties of a synchronous motor.

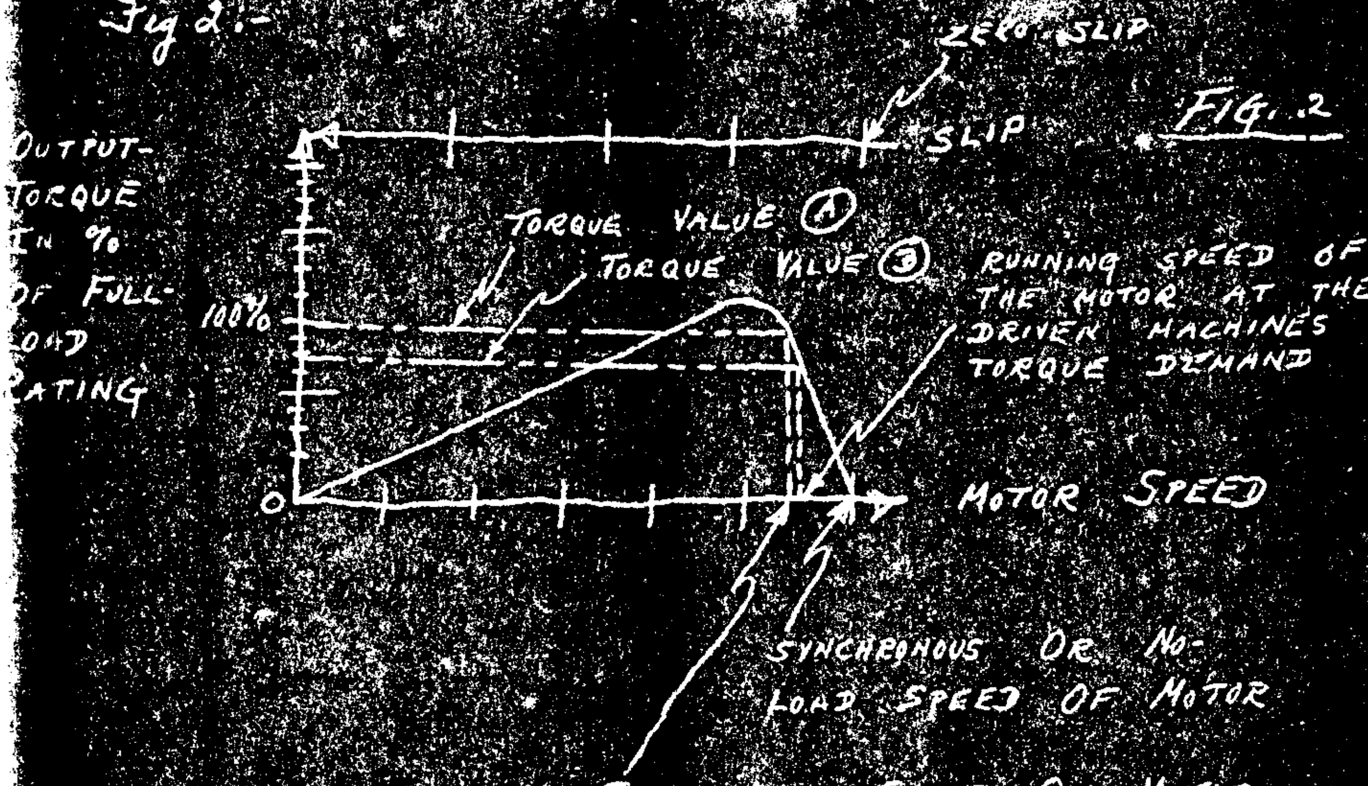
THE NOW PROJECTED IDEA:-

The now projected idea goes back to the use of an induction type motor as the Driver for a color-wheel or color-drum. It has already been indicated [Pages (2) and (3), — in particular (3)] that an induction motor lends itself to constant speed service if either of two conditions be imposed. The choice here goes to that alternative listed under Item (b) ~~under~~ on Page (3).

Let us suppose that as a primary condition, the motor that is selected to drive a given color wheel or color drum is, as per the normal and usual design procedures, 10-25% "over-size", and that therefore its operating speed at standard supply voltage would lie somewhere between its full-load speed and its no-load speed. This condition would be indicated by

Fig 2:-

FIG. 2



when the running speed of the motor and the machine would be between the full-load speed of the motor and the motor's no-load or synchronous speed. Let us also suppose that the full-load speed of the motor is 1725 rpm and its no-load speed is 1800 rpm, and, finally, let us suppose that ~~X~~ the torque-demand of the driven color-wheel or color-drum within the equilibrium speed range is such that a speed of 1750 is obtained from the motor. Thru a gear ratio between the motor shaft and the wheel- or drum-shaft of 50:60, this would mean a running speed of approximately 1458 rpm for the wheel or drum. To bring the wheel or drum to a constant speed of 1440 rpm thru the indicated gear set would demand a motor speed of approximately 1729 rpm. To accomplish this with the conditions listed above, to reduce the motor's speed from 1750 rpm to 1729 rpm, would require, by Fig. 2 that the torque-demand on the motor be lifted from Torque Value (B) to a value very close to Torque Value (A). This task, which amounts to supplementing the driven device's torque-demand by an increment in torque that when added to Torque Value (B) would approximate Torque Value (A), the newly-projected idea proposes be accomplished with an Eddy Current Brake which is controlled by a Servo-mechanism linkage.

Before continuing with a description of the newly-projected idea, let us examine, at least superficially, what is involved. If 1725 rpm is the full-load speed of the motor involved and its nominal horsepower rating were $\frac{1}{8}$ HP (0.125 HP), then the full load torque-output of the motor would be:-

$$\frac{0.125(63025)}{1725} = 4.57 \text{ in-lbs.}$$

If the motor were as much as 25% overage and if the loaded speed without external influences were 1750 rpm as indicated above, then

$$\frac{(1-0.25)(0.125)(63025)}{1750} = 3.37 \text{ in-lbs.}$$

would be its output torque at the above-indicated condition of loading, and

$$4.57 - 3.37 = 1.2 \text{ in-lbs}$$

would have to be the torque increment borne by the Eddy Current Brake Assembly. Assuming that the braking action would occur at a radius of 12" from the axis of rotation, then

$$\frac{1.2}{12} = 0.1\#$$

would have to be the force exerted by the Brake at the indicated radius.

Consider then an arrangement as per Fig. #3 in which a rim (of aluminum), attached to the color-wheel or color-drum, is made to pass thru a magnetic structure of the type indicated in Fig. #3:-

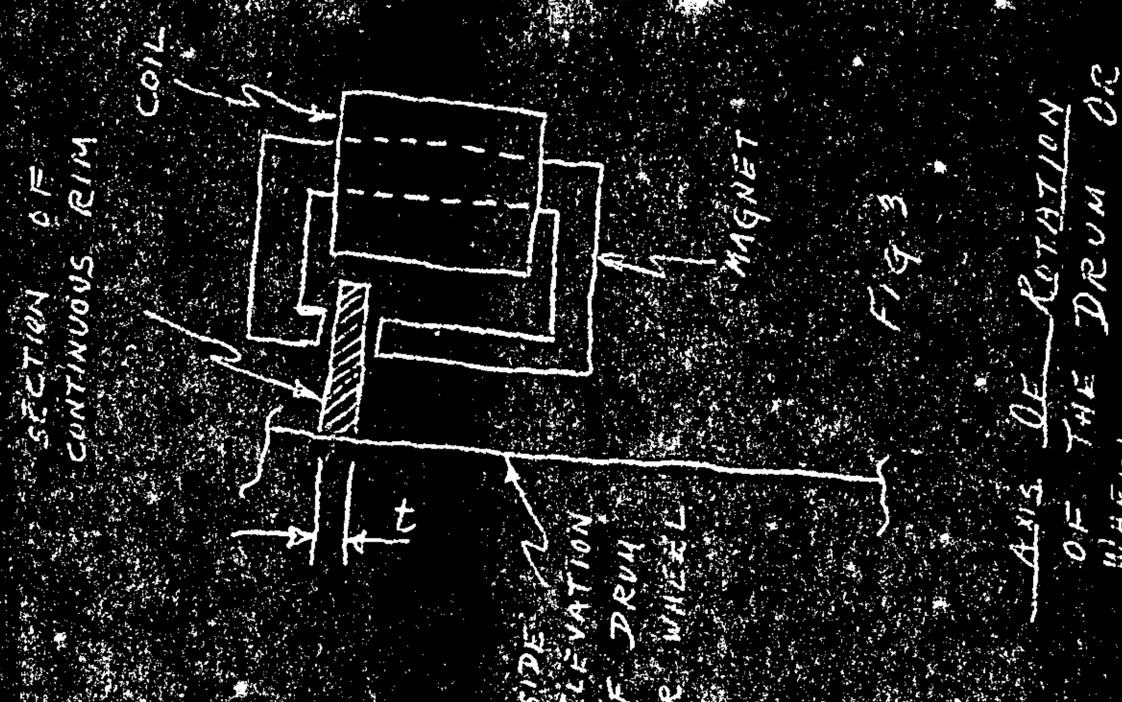


FIG 3

Let the pole face be square, and let the average path of the induced currents be assumed to be $4l$, where (l) is the length of any side of the pole face. The magnitude of the induced E.M.F. in a circuit in which a conductor of length (l) cuts magnetic flux of density B at a velocity of (V) is given by:-

$$E = BlV \times 10^{-8} \qquad (1)$$

where (E) is in volts, (l) is in cms., and (V) is in cms. per sec. If the resistivity of the conductor is given by (ρ), then

$$R = \frac{4\rho l}{tl} = \frac{4\rho}{t} \qquad (2)$$

would define the resistance in ohms to the induced currents where:- (ρ) is in ohm-cms.; $4l$ = the average current path (cms.); and the product of (t) — in cms. — and (l), also in cms., defines (A), the area of the conductor. From (1) and (2), it follows that I, in amps, would be given by:-

$$I = \frac{E}{R} = \frac{BlV \times 10^{-8}}{\frac{4\rho}{t}} = \frac{BlV(10^{-8})t}{4\rho} \qquad (3)$$

The force acting on a conductor in a magnetic field for the above-indicated construction is given by:–

$$F = \frac{B I l}{10} \qquad (4)$$

where:– (F), in dynes, is the mentioned force; (I), in amps, is the current flow in the conductor; and, (l), in cms., is the length of the conductor. Then, by (3) and (4), we obtain

$$F = \frac{B l}{10} \cdot \frac{B l v (10^{-8}) t}{4 \rho} = \frac{B^2 l^2 v (10^{-9}) t}{4 \rho} \qquad (5)$$

Converting (F) which in (5) is yielded in dynes, to units of gms., since

$$980 \text{ dynes} = 1 \text{ gm},$$

then

$$(F_g) = \frac{B^2 l^2 v (10^{-9}) t}{4 \rho (980)} = \frac{B^2 l^2 v (10^{-11}) t}{39.2 \rho} \qquad (6)$$

For a speed of 1440 rpm (24 rps) and a radius of 12", (v) would have a value of

$$v = 2\pi (24)(12)(2.5) = 4530 \text{ cms./sec.}$$

and, force (6) may be written

$$F_g = \frac{45.3 B^2 l^2 t (10^{-9})}{39.2 \rho} = \frac{1.155 B^2 l^2 t (10^{-9})}{\rho}$$

Taking

$B = 750$ gauss

$l = 1$ cm.

$t = 0.2$ cm.

$\rho = 3.21(10^{-6})$ ohm-cms.,

we find that

$$F_g = \frac{7.5^2 (10^4)(1)(0.2)(10^{-9})(1.155)}{3.21 (10^{-6})} = 40.3 \text{ gms.}$$

$$\frac{40.3}{454} = 0.0886 \#$$

If we were to use two such magnetic structures as have been indicated above, thus giving the arrangement a wide latitude of operation about the required 0.1# force calculated on Page 7, then a braking force of

$$2(0.0886) = 0.1772\ \#$$

would be available. By definition

$$\theta = BA \tag{7}$$

and since $A = l^2 = 1\text{cm}^2$, then $B = \theta$. The required magnetomotive force is given by:-

$$\theta = \frac{mmf}{R} \tag{8}$$

where R = the reluctance of the magnetic path, and is, in turn, given by

$$R = \frac{l_1}{\mu A} \tag{9}$$

where:- l_1 = the length of the magnetic path; μ = the permeability of the path; and, A = the area of the flux path. Setting $l_1 = 0.3$ cm, μ = and since $A = 1\text{cm}^2$,

$$R = \frac{0.3}{(1)(1)} = 0.3 \text{ reluctance units}$$

By (8) then, since

$$mmf = \frac{4\pi NI}{10}, \tag{10}$$

then

$$750 = \frac{0.4\pi NI}{0.3}$$

$$NI = \frac{750(0.3)}{0.4\pi} = 179 \text{ amp-turns}$$

If (I) is to be not more than 0.005 amps as an average condition,

$$\frac{179}{0.005} = 35{,}800 \text{ turns/coil}$$

would be required.

Assume the use of a 36 gage wire, since 36 gage wire = 0.005
then

$$35{,}800(25) = 895{,}000 \text{ cir. mils} \doteq 0.895 \text{ in.}^2$$

would have to be the x-sectional area of the winding on any one side of the square pole section. For "x" = ½", then

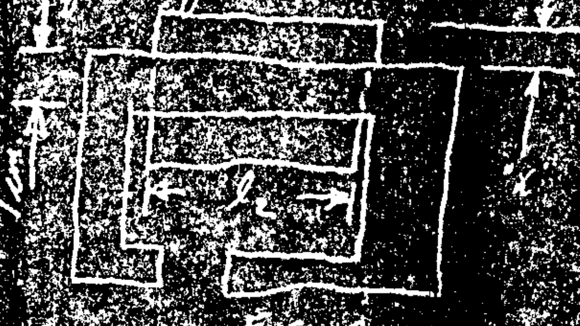


FIG. 4

$$l_2 = \frac{0.895}{\frac{1}{2}} = 1.790''$$

Since any side of the pole is 1 cm. = 0.4", then the minimum length of any winding-turn would be 1.6" while 5.6" per turn would be the maximum length. This would mean an average length of 3.6" per turn; or a wire-length of

$$\frac{35{,}800(3.6)}{12} = 10{,}720 \text{ ft. per coil}$$

Since the resistance of 36 gage wire is approximately 450 ohms/1000 ft., then

$$\frac{10{,}720}{1000} \times 450 = 4830 \text{ ohms}$$

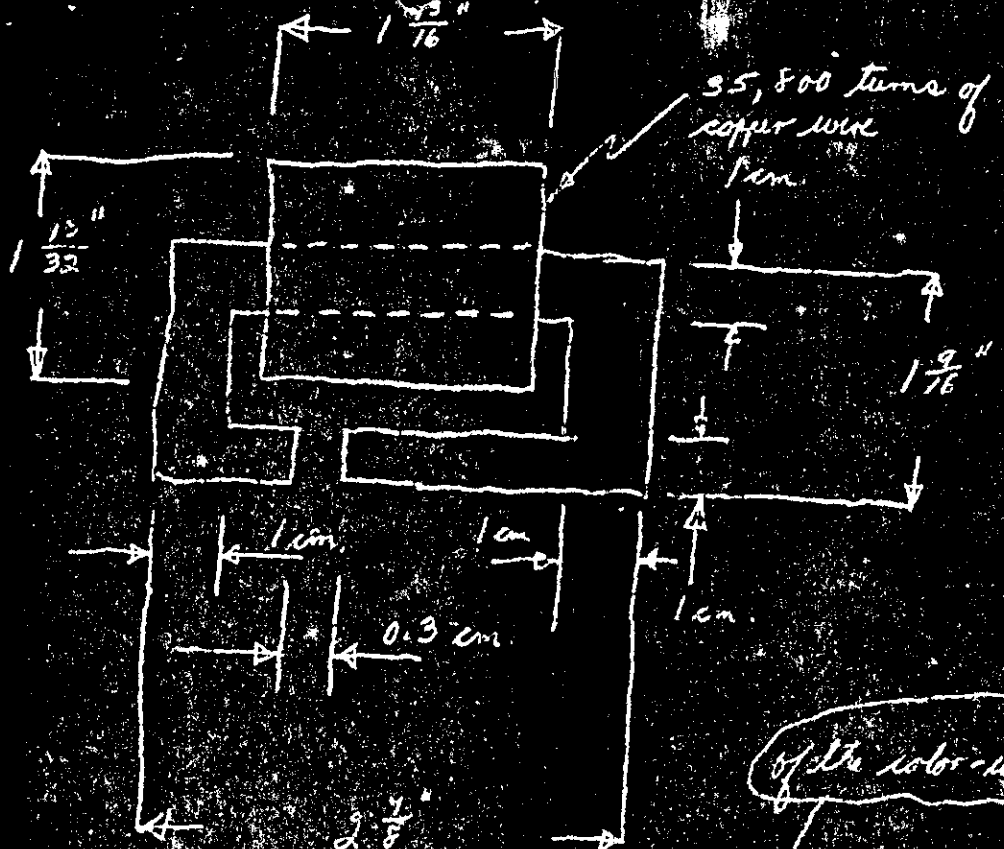
would be the resistance per coil. Two coils in series, as stated above would mean a total resistance of

$$2(4830) = 9660 \text{ ohms}$$

The feeding of 5 milliamps against a resistance of roughly 10,000 ohms is a task which lies comfortably within the range of a 6SN7 vacuum tube.

By the above approximations, it will be seen that:–

a. two ~~[illegible]~~ magnetic structures as per the sketch given below:–



of the color-wheel or drum

placed opposite another (to establish balance around the axis of rotation) ~~opposite~~ fed by a tube of the class indicated above

and

b. a servo-mechanism based on a phase detection or discrimination section comparing the pulse frequency from a slug-alternator-and-pulse magnet arrangement with the vertical r-p pulse of the set, in which the out of balance or error voltage from the phase detection circuit is used to bias the operation of the tube feeding the brake magnets

would provide a system, when properly stabilized by anti-hunt provisions, that, in conjunction with an aluminum rim of 0.2 cm thickness attached to the wheel or drum, would yield an accurate control over an induction motor towards obtaining constant (and controlled) speed service from the motor.

Thus a novel servo-mechanism for the control of an induction motor (single-phase, — or even 2-phase) has been outlined. It now remains to argue the merits of one system with respect to another.

CRITIQUE OF THE DESCRIBED SYSTEMS

For obvious reasons, it would be best to treat with eac
systems on their individual merits, and then to treat with their
comparative positions.

The CBS synchronizing method has as its strongest adva
the fact that it employs a type of motor, an induction motor,
will permit of a wide latitude in translation as the screen
built go upward. As the industry moves towards larger scre
color viewing sets, CBS will be able to use its system, al
intact, except for increasing the motor-sizes involved. The large
motors which will become involved will call for a comparati
moderate increase in the cost of the synchronization systems they
employ. As a rule, induction motors are less expensive, more
rugged, and smaller than corresponding speed synchronous motors
these are important factors from many points of view. There can
no doubt that the "tightness" of CBS system's arrangement woul
something less than one could obtain from the best kind of a desig
a synchronous motor power, but a stable and accurate servo
solution using an induction motor is possible at a lower production cost.

The systems described heretofore under the heading of "SOME
POSSIBLE NON-SERVO MECHANISMS" require some indi
comment, after their common properties are discussed. In ge
each of systems from (A) thru (F) rejects the use of one of th
set of powerful and accurate operating signals as a simp
comparison standard to gauge the performance of an "externally p
motor, but rather these systems use such signals as ground re
to guide the performance of a motor-power-generating section of th
system and underlying principle is rigidly adhered to in
(A) thru (D), and, possibly, less rigidly in the cases of (E
F).

The principle of ~~employing~~ adding a motor-power-generating section to the set and controlling the characteristics of the generated power by "locking" the motor-power-generating section to one of the set's powerful and accurate signals commits one to the idea of synchronous type motors, for these are the only type of motor that can exploit the aforementioned "lock". There can be no doubting of the control which the "lock" exerts over the performance of the motor-power-generating section of the set; but every theoretical reason exists for believing that only a fairly special type of synchronous motor can avoid attributing a certain "looseness" to the system as a whole. Ordinary construction synchronous motors do "hunt" and oscillate about their nominal "absolutely" constant speeds. For most synchronous motor services, the mentioned "hunting" or oscillation is a negligible item, for the service tolerances are sufficiently wide to take this into account. In the "NON-SERVO MECHANISMS" which these motors serve, they, as noted above, must incorporate within themselves the phase detection and anti-hunt functions which are otherwise taken care of in the CBS synchronization system. Hence, the synchronous motors which must be used here must be of a construction that limits the "hunting" and oscillating tendencies to a negligible limit. Given such a specially constructed synchronous motor (which means that, if one were to use a motor which approximates the stability which the "locked" motor-power-generating section would have), there could be no questioning of the stability which such an arrangement would have.

Finally, we are brought to the system projected under the heading of the "THE NEW-PROJECTED IDEA". It has already been indicated that the "NEW-PROJECTED IDEA" amounts to a complete reversing of the fundamental concept behind the CBS servo. Whereas CBS achieves constant speed service thru a control exerted over the input conditions to the motor, the "NEW-PROJECTED IDEA", which will hereafter be referred to as the Eddy Current Brake

Principle, elects to achieve stable constant speed service by co
the motor's work-output. The fact that the Eddy Current
Principle uses an induction motor means that every induc-Tegh
merit that was previously attributed to the CBS Servo-system
it employs an induction type motor, must also be attributed
now-proposed system. The other advantages which the now-prop
system make available will come out in the comparisons and
treatments listed below:-

For quite clear reasons, the comparisons noted below will
referred to the now-projected idea as a reference standard:-

Control over the input-conditions to the motor, which in CBS
technique for obtaining constant speed service from an induction mo
is achieved. Here a saturable reactor is a means of controlling
applied voltage. Saturable reactors are expensive equipment, and
the best of production conditions will remain so, for the iron of thes
must answer to the very highest of standards for magnetic irons.* At p
it is the writer's belief that the saturable reactor of the type used
cost in the order of $20 each; and further, it is estimated that
little hope can be held for these to be produced at a selling price
than $5 each. By comparison, the brake magnets of the now-pro
idea would cost substantially less than $5.00 for both, a rea
good estimate being about $1.50 for the two magnets. A less important
factor resides in a comparison between the costs of a 6SN7GT (which
is used to "power" the magnets) and the cost of the 6AH6 (which
used to operate the saturable reactor). A difference in the order of
is involved here. A more important factor is the "time factor" of
saturable reactor versus that of the magnetic structures which ha
been proposed here. A saturable reactor has a "time factor" of
$\frac{1}{20}$ sec., which is large in comparison to the phenomenon to which

---

* The optimum gain properties of a saturable reactor are critically
pendent on the quality of the iron used.

accomodation must be made, and a [illegible] very much larger than one would obtain from the brake magnets.

Now, turning to a comparison between the "NON-SERVO MECHANISMS" and the now-projected idea, the cost of a synchronous motor versus that of an induction motor forms [illegible] the most obvious item of comparison. The cost of a 4-pole synchronous motor is substantially larger than that of a 4-pole induction motor. The cost of a 12-pole synchronous motor as is proposed in Item (B) ["Further SOME POSSIBLE NON-SERVO MECHANISMS"] would be even larger. Going into the question of the motor-power generating sections which each of the proposals from (A) thru (F) involve, it is clear that here we have large items of additional expense which must be superimposed onto the high cost of a synchronous motor of fairly special design. The role that the motor-power-generating section would play in building up the overall cost of the whole [illegible] drive-down [illegible] being [illegible] especially pronounced in the case of drive motor [illegible] (which would happen when the industry moves toward [illegible] larger [illegible]). In this connection, it should be recalled that the [illegible] of the CBS synchronization system to be [illegible] without [illegible] increase in cost [illegible] larger [illegible] was considered above to be one of its outstanding advantages [illegible]. The factor which [illegible] from the [illegible] of type motor [illegible] with the substitution of an [illegible] accurate and [illegible] signal [illegible] power-generating section [illegible] to Ideas (A) thru (D), but [illegible] since (E) and (F) [illegible] (E) [illegible] (F) [illegible] the [illegible] of the [illegible] is shifted to the induction motor [illegible] arrangement [illegible] power-generating section [illegible] large [illegible]

One cannot help but feel that Schemes (E) and (F) avoid specifically to meet the objection that Schemes (A) thru (D) would demand a compounding of the higher cost of a synchronous motor with the increasing cost of larger size power-generating sections as larger size drives are demanded for larger size systems. This accommodation [illegible] is not really complete however, for [illegible] larger size drive is not really [illegible]. As larger size drives [illegible] which [illegible] considered that the synchronous motor [illegible] it cannot be considered that the field constant in size, or even [illegible] of the [illegible] arrangement [illegible] held constant [illegible] $\frac{1}{30}$ [illegible] induction rotor and relatively constant. The relative inertias of [illegible] are so far apart that a $\frac{1}{300}$ [illegible] synchronous motor [illegible] would be too difficult [illegible] of the induction motor [illegible] induction motor [illegible] remembered that the [illegible] of the rotor diameter [illegible] at least the first power of the rotor diameter, [illegible] largely concentrated at [illegible] the [illegible] the product of the rotor's [illegible] the [illegible] a factor of at least [illegible] radius of gyration [illegible] of the [illegible] would [illegible] the necessity of holding the [illegible] these facts [illegible] and the induction motor [illegible] synchronous [illegible] would mean that [illegible] constant [illegible] synchronous motor [illegible] to increase [illegible] generating sections [illegible] with the [illegible] to support the [illegible] the running [illegible] motor [illegible] induction motor [illegible] lowering [illegible] block [illegible]

Without further belaboring the point, it is then clear that in Schemes (A) thru (F), the translation of the basic notions to larger size drives would be costly because of the higher cost of synchronous motors as compared with induction motors, and because the necessary power-generating sections would have to increase with the size of drive involved [even where Schemes (E) and (F) are used].

Before leaving the topic of the "NON-SERVO MECHANISMS" it should be observed that as larger size screens are supplied for color-viewing, and as ~~larger~~ especially as this begins to involve the use of drum rather than disc assemblies, the question of the size (the physical spatial dimensions) of the motor frame will become increasingly important. As previously pointed out, synchronous motors are larger than induction motors of the same horsepower rating, and hence this factor would be aggravated by the use of synchronous motors.* And, lastly, it should be remembered that when Schemes (A) thru (F) involve multi-vibrator or counting circuits as component parts of the vertical pulse-to-generated A.C. motor-driving power set-ups, these are an additional cost item.

Returning to the question of the comparative merits of Schemes (A) thru (F) versus those of the now-projected idea, it will be recalled that it was said of the "NON-SERVO MECHANISMS" that there could be no doubling of the "tightness" of the "lock" that would be established via these "NON-SERVO MECHANISMS". This puts it up to any servo-mechanism, whether it be the CBS servo or the Eddy Current Brake Principle Servo, to match the stability which

---

* When going into the question of motor-size, it should be noted in connection with Scheme (B) the frame size of a 12-pole motor would be larger that that of a corresponding horsepower 4-pole mo[tor]

[illegible] field [illegible] of the magnetic structure
[illegible] — [illegible] for [illegible]
[illegible] itself could [illegible]
[illegible] by the [illegible]
[illegible] the [illegible] factor in determining [illegible]
[illegible] the [illegible] dimensions, the
[illegible] would give a comparable
[illegible] obtained [illegible] (A) thru (F). The possible
[illegible] be incorporated into the [illegible] linkage are
[illegible] the principle of [illegible] developing a feed-back
[illegible] the feed-back with the discriminator or
[illegible] operating the tube feeding the brake magnet
[illegible] general principle could give the servo-linkage
[illegible] would indeed [illegible] the best of what could be
[illegible] (A) thru (F). One of the ways of achieving the requ
[illegible] would be to have the Main Drive Shaft drive
[illegible] tachometer of the type made by Elliott; while
[illegible] would be to take a portion of the pipes- or
[illegible] of the alternator, full-wave rectify the said output
[illegible] filter and then employ it
[illegible] suggested above. Finally, towards the goal
[illegible] of the stability which schemes (A) thru
[illegible] it is possible to alter the slope of the speed
[illegible] of an induction motor towards a less steep
[illegible] a less critical sensitivity) by introducing
[illegible] increased resistance into the motor rotor. There are a
number of conventional ways of accomplishing this, and
[illegible] would suffice.

Thus in summary, the now-projected idea offers the following advantages over the CBS synchronization system:-

a) A cost advantage in that the now projected idea [illegible] employ a [illegible] expensive tube to "power" the operated [illegible] as in the now-projected employs a far [illegible] expensive operated mechanism (an Eddy Current Brake) [illegible] does the CBS system (with its saturable reactor).

b) [illegible] efficient control in that the Eddy Current Brake [illegible] by the now-projected idea involves a smaller [illegible] factor than does the saturable Reactor *, and [illegible] the [illegible] factor characteristic of the [illegible] the [illegible] effects [illegible] of the addition of [illegible] Current Brake [illegible] mentioned, on [illegible] effects such as [illegible] the securing of the [illegible] without [illegible] system.

[illegible] proposed [illegible] system [illegible] offer the following advantages over the [illegible] MECHANISMS [illegible]

a) [illegible] advantage in that the now-projected idea [illegible] that [illegible] involve [illegible] the now projected idea does not involve counting or [illegible] between a set pulse [illegible] signal generated from such a translation i.e. [illegible] that the now-projected idea does not [illegible] motor-power-generating section as part of [illegible]

b) [illegible] advantage in that the induction motor used [illegible] now projected idea is smaller, for any given horsepower [illegible] than is a synchronous motor.

* [illegible] factor of a saturable reactor the more costly does [illegible] a 2 cycle saturable reactor would [illegible] be [illegible] as estimated above, then on a mass production basis

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/20/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained John D. Walker

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

147. Photostatic copy of Drawing #6 Revised.
148. Photostatic copy of Drawing #7 Revised.
149. Photostatic copy of Drawing #8 Revised.
150. Photostatic copy of Drawing #9 Revised.
151. Photostatic copy of Notes on Drawing #9.
152. Photostatic copy of Paper entitled "Errata, Addenda, and Comments".

81

100-95068-1B

DWG. #6 REVISED

Page 1

1. 1/4" x 1" x 1/8" Bakelite strip glued to plywood base (2)
2. plywood base 1" x 1" x 5/8" formed to give a full line of contact of (1) with the Outer Diam of 4" [illegible] Ring along the Ring's periphery
3. mild steel housing for bronze bushing (4) to be formed from 5/8" I.D. x [illegible] 1020 seamless steel tubing 5/8" lg, and welded [illegible] of the lever bar (6)
4. [illegible] I.D. x 5/8" lg Oil-less bronze bearing bushing (Boston Gear Works)
5. [illegible] (5)
6. 1" lg [illegible] wide slot in which the actuator pin (7) rides
7. 1/4" [illegible] drill rod (steel), hardened and press-fitted into the lever (6). The actuator pin to be 5/8" lg.
8. 3/8" wide x 5/8" thk x 1 1/2" lg mild steel bar, to be tied in according to convenience into the indicated end of the solenoid's plunger (9)
9. Pin-style tying (8) into the mounting [illegible] solenoid's plunger
10. Actuating solenoid & plunger:
11. Allen-Bradley size #6 wall mounting model, 110 V, 60 cycle, A.C. Solenoid (Bulletin 860)
13. Capscrews & bolts anchoring the solenoid's mounting channel to bedplate
14. 1/8" [illegible] mild steel gusset running from the solenoid's bedplate to the brake's baseplate

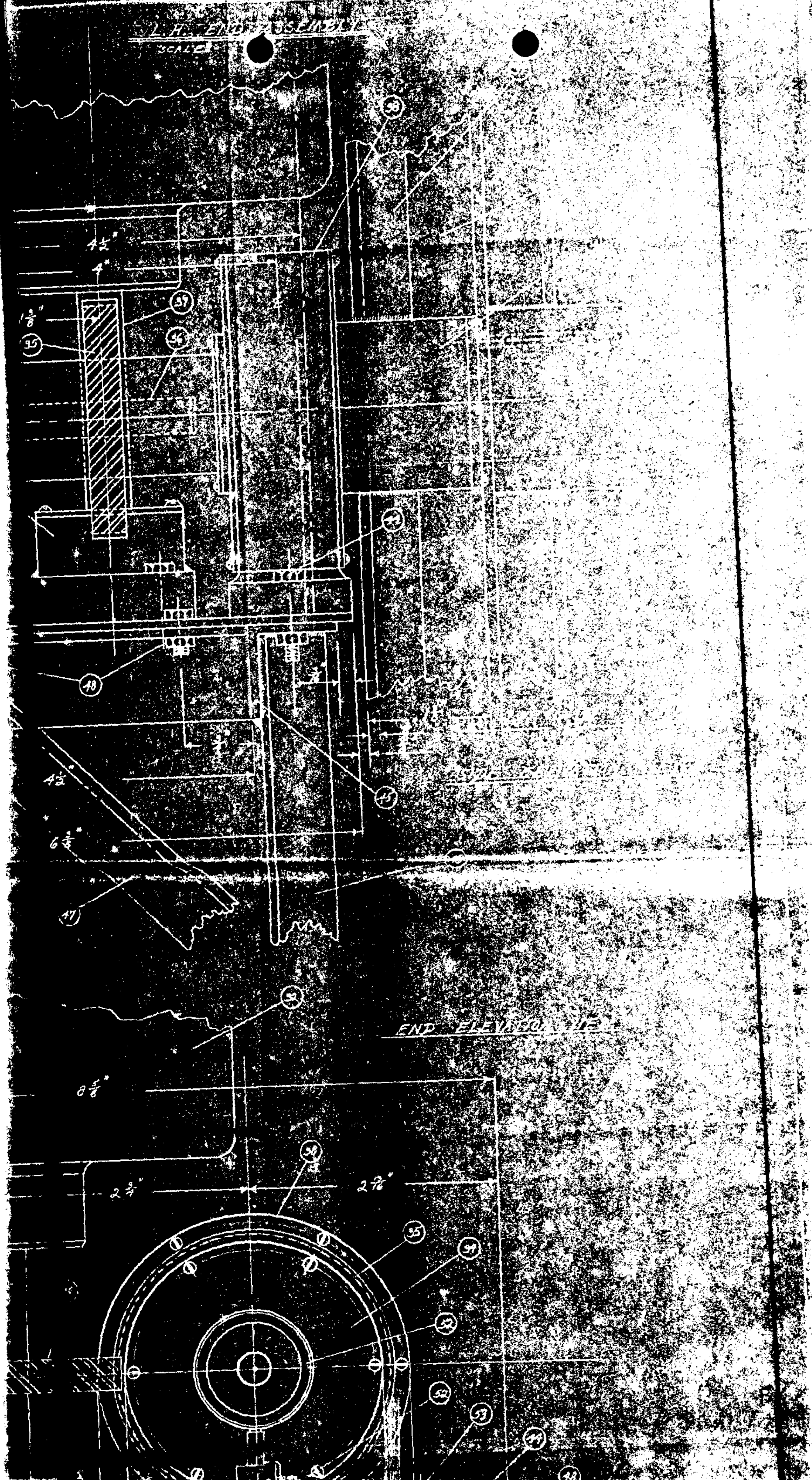
15. Identical with (14) except that this gusset is also welded to the gusset (17)
16. Tips of the solenoid's coil
17. $\frac{1}{8}$" [illegible] mild steel gusset plate running between one leg of the angle (18) and the baseplate (57)
18. [illegible] $\frac{3}{4}$" x $\frac{1}{8}$" structural steel angle
19. #5 wood-screws
20. Knob at one end of the solenoid's plunger
21. Retainer for the Recoil Spring (22). Dimensions to con-[illegible] [illegible] be tied into the "knob" portion (20) of the solenoid's plunger by any means that assure squareness of the Retainer with the plunger's principal axis
22. Helically wound Recoil Spring (Specifications soon)
23. Vertical strips for Recoil Spring Mount of mild steel plate. Horizontal strip of same material. Dimensions of all named members to [illegible] where they are not defined by Dwg. # 6
[illegible] [illegible] Respective & nut tying the Retainer (24) to the horizontal strip of the Recoil Spring Mount
24. Retainer for the [illegible] end of the Recoil Spring Mount. Identical with (21) except for method of mounting, and the fact that (21) [illegible] with the "knob" (20) while (24) is fixed.
25. $\frac{1}{8}$" mild steel gusset running between the angle (18) and the plate (57). Height of the gusset plate same as (17)
26. [illegible] drill for the mounting of the Brake Assembly
27.
28. Recoil Spring (22) in Plan Perspective

29. "Stop" end of the Solenoid's plunger as seen in Plan Perspective
30. Boston Gear Works 1/4" I.D. × 5/8" O.D. × 7/16" Thk. Ball-Brng. Thrust Ring
31. 5/16" ⌀ mild steel rod, welded as indicated into one leg of the angle (18)
32. Induction Type Drive Motor (further specifications soon)
33. 3/8" ⌀ mild steel bedplate for the Drive Motor (See End Elevation View)
34. 1 1/4" shaft size ball bearing pillow block
35. Boston Gear Works 3" P.D., 60 teeth, L.H., 45° helix angle, 3/4" face helical gear *
36. Boston Gear Works 2.5" P.D., 50 teeth, L.H., 45° helix angle, 3/4" face helical gear *
37. Drive Motor's output shaft
38. 1 3/4" shaft size ball bearing pillow block
19. 3/4" × 3/4" × 1/8" aluminum angle spokes of Outer Drum L.H. End-Ring
10. Outer Drum L.H. End-Ring
11. Hub of Outer Drum, L.H. End-Ring
12. Hub of Inner Drum L.H. End-Ring
13. 3/4" × 3/4" × 1/8" aluminum angle spokes of Inner Drum L.H. End-Ring

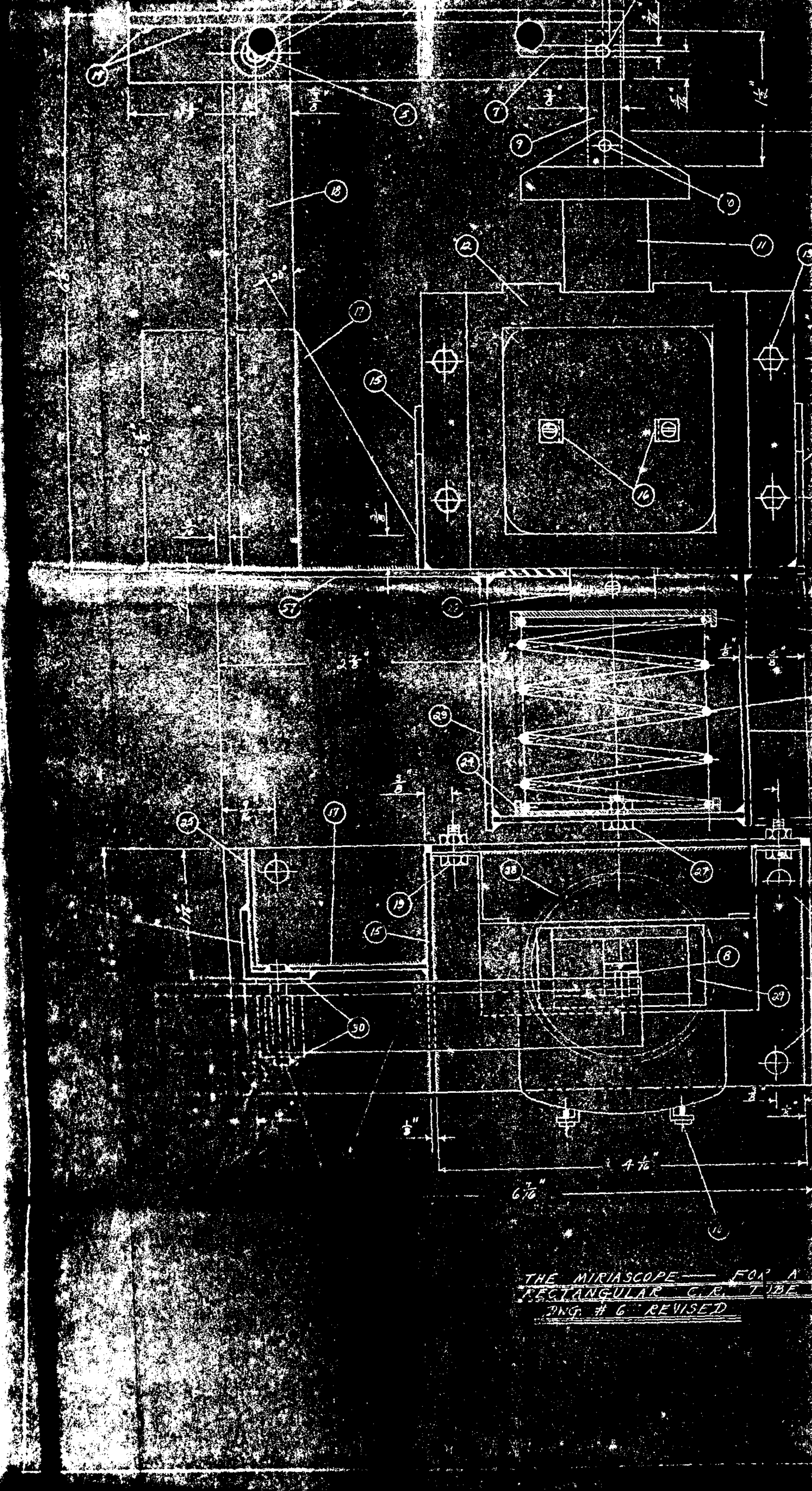
Oil Bath in which gears run is not shown here. See Dwg. # 8

Dwg. #6 REVISED

44. 7/8" capscrew & ~~bolt~~ nut tying (38) to the members (45) & (51).
45. 1" x 1" x 1/8" structural steel angle top member of L.H. A-frame
46. 3/4" x 3/4" x 1/8" structural steel & legs of the L.H. A-frame
47. 3/4" x 3/4" x 1/8" " " & strut member of the knee brace combination (47) and (56)
48. 7/8" capscrew and ~~bolt~~ nut tying (51) to (56) on the far side of (51) rather than the one seen here
49. Outboard bearing for the Motor shaft
50. [illegible] bearing (49), and on which (49) is mounted
51. [illegible] steel baseplate for the Drive Assembly
52. [illegible] for Commutator Assembly
53. [illegible] capscrew tying (39) to the bed plate (50)
54. [illegible] mild steel gusset plate. One at each end of the bedplate (52)
55. [illegible] structural steel & welded to the bedplate (52). One at each end to stiffen (53)
56. [illegible] structural steel [illegible] horizontal member of the knee brace combination (56) and (47)
57. [illegible] mild steel baseplate for brake assembly



4"
35
37
48
45
47


THE MIRIASCOPE — FOR A
RECTANGULAR C.R. TUBE
DWG. # 6 REVISED

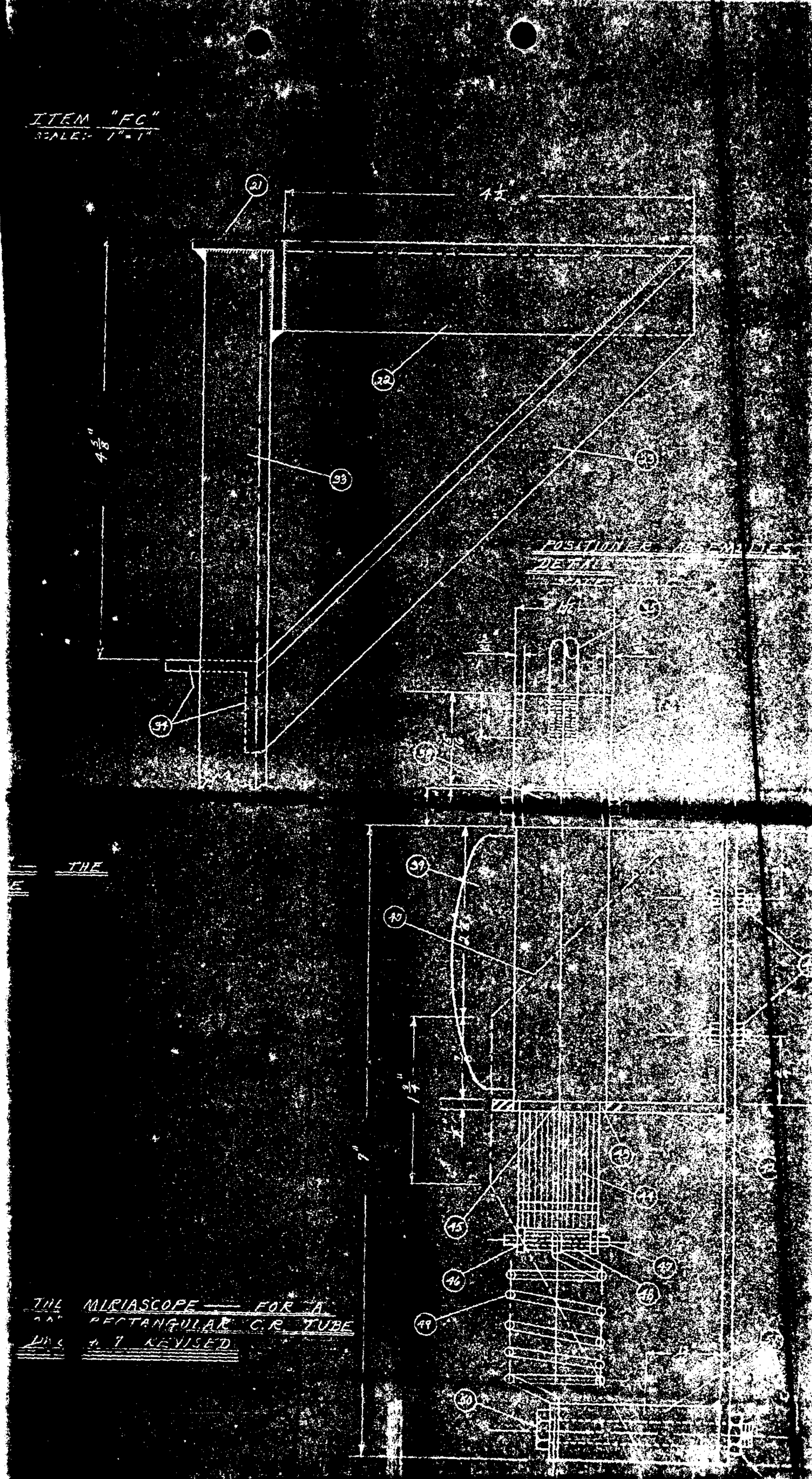
DWG # 7 REVISED

Page 1

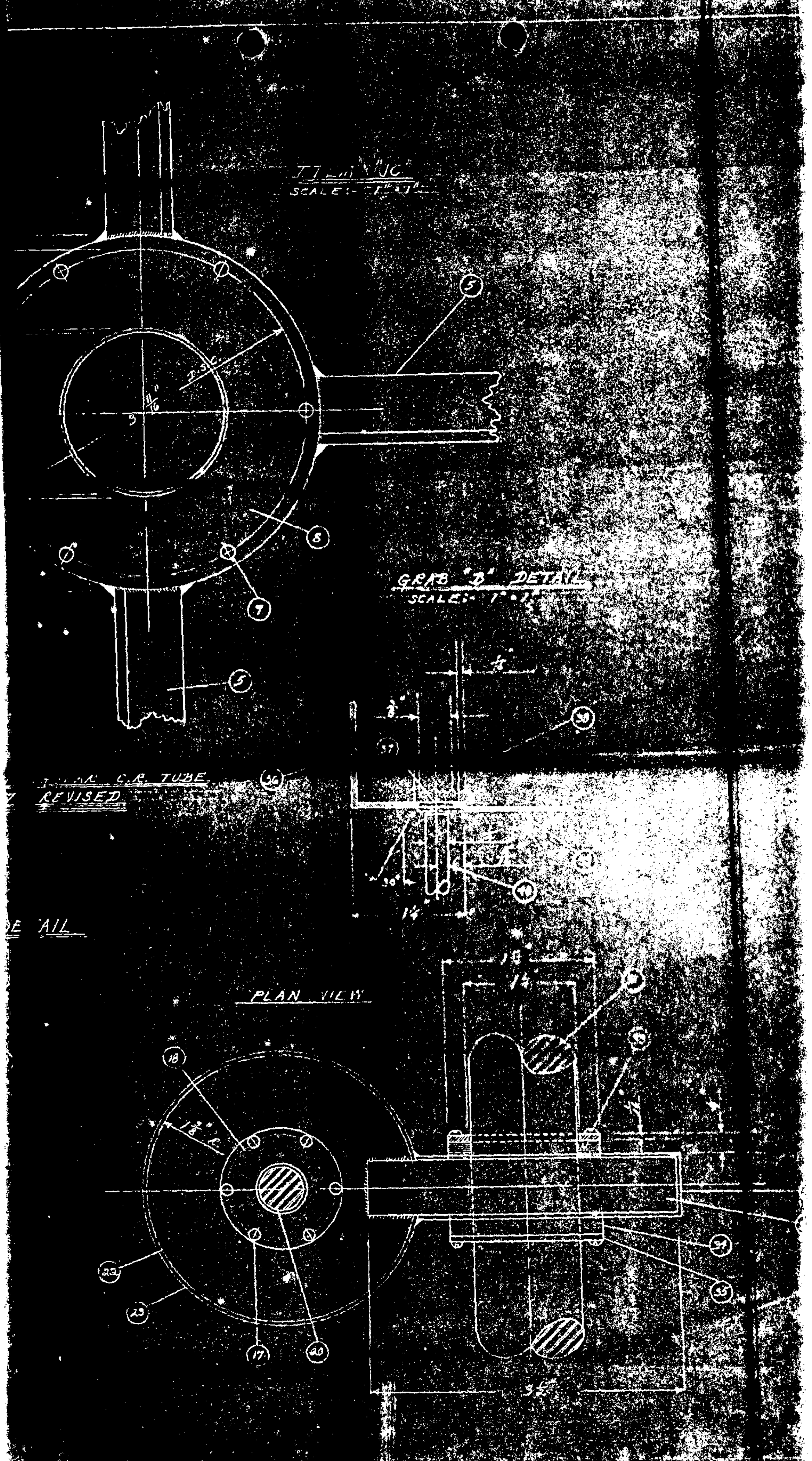
1. Mild Steel Cover-plate
2. $\frac{1}{16}$" Ø Rd. Hd. machine – 6 req. on $1\frac{3}{4}$" D.S.C.
3. S.A.E. 1020 steel housing, to be fabricated from $1\frac{5}{8}$" O.D. × $1\frac{1}{8}$" I.D. Tube Stock
4. $\frac{7}{16}$" shaft size Nice 1600 Series, permanently lubed and sealed, ball bearing
5. Pad plate of $\frac{1}{4}$" mild steel ℞
6. $\frac{1}{4}$" Ø drills for mounting of pad plate
7. Outboard Bearing member of the Pad-plate
8. See Item (3)
9. Drill & tap for $\frac{1}{4}$" Ø capscrew to mount $1\frac{1}{4}$" shaft-size ball bearing pillow block
0. Horizontal principal centerline of $1\frac{1}{4}$" shaft-size ball bearing pillow block
1. Drill and tap for $\frac{1}{4}$" allen Holless Setscrew
Shoulder against inner race of $1\frac{1}{4}$" shaft size ball bearing
$\frac{1}{16}$" wide keyway for $\frac{1}{16}$" × $\frac{7}{16}$" setscrew connecting the driven gear to the Main Drive Shaft
Keyway for $\frac{1}{4}$" × $\frac{1}{4}$" key connecting the hub member of the Inner Drum L.H. End-Ring to the Main Drive Shaft
1. Shaft of $1\frac{1}{4}$" O.D. × $\frac{5}{8}$" I.D. Seamless SAE 1020 Steel Tube Stock
1. Direction of Rotation of the Drum Assembly
1. L.H. End Ring of the Outer Drum
1. Position "B"

DWG #7 REVISED

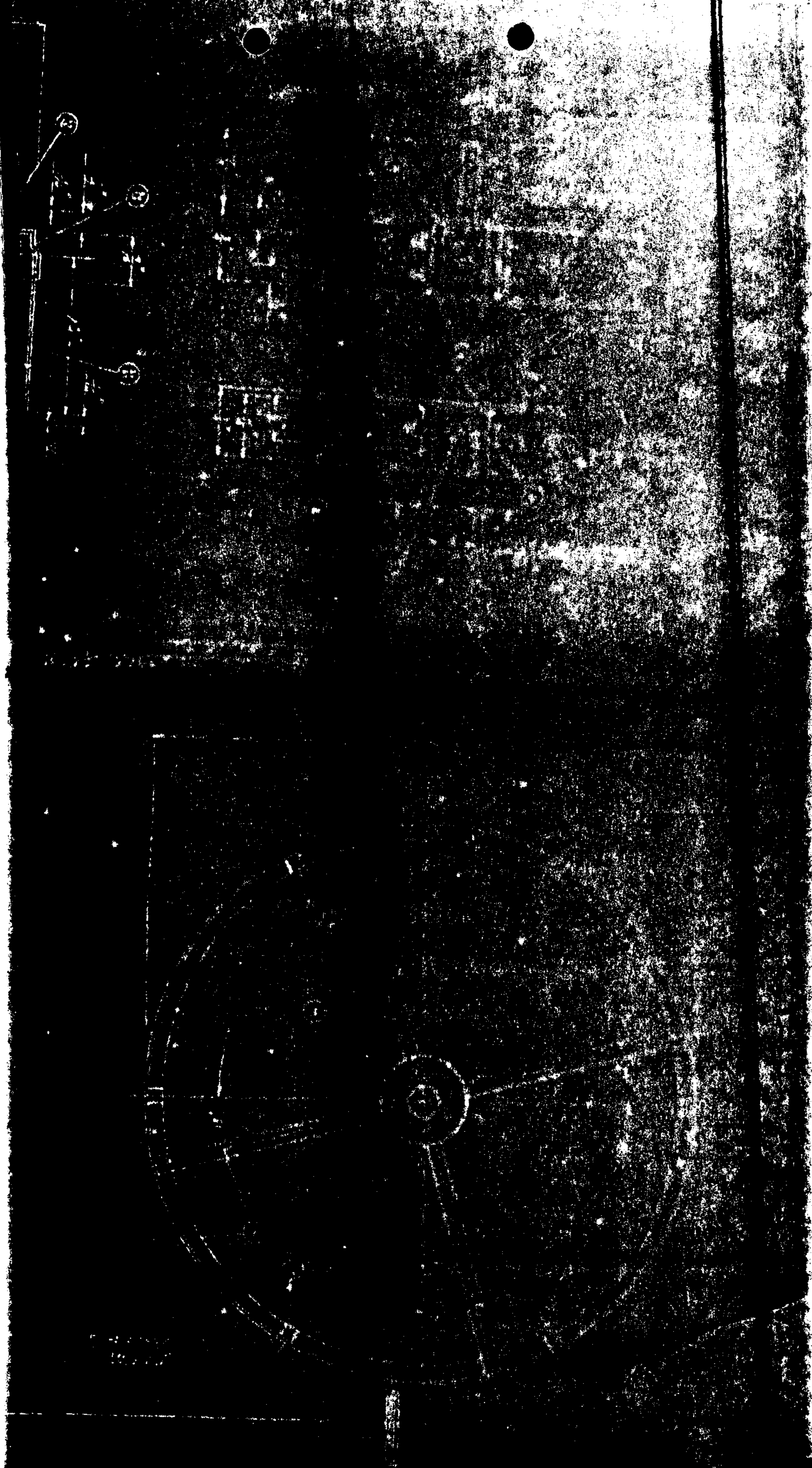
38. "Knob" portion of solenoid's plunger
39. Allen-Bradley, Size #5, Wall Mounting Type, 110 v., 60 cycle, A.C. Bulletin 860 Solenoid.
40. 1/8" th. mild steel gusset plate between (42) and vertical portion of frame
41. Capscrews and nuts tying mounting channel of solenoid to the bedplate member of the frame
42. Horizontal plate member of frame, 2 7/8" x 4 7/8" x 1/8"
43. Slot in (42) for plunger (44). Must be wide enough to accomodate "stop" portion of the plunger
44. Plunger (armature end thereof) of Solenoid
45. Pole Faces of Electromagnet, against which (44) goes "home"
46. Mounting Wings on "stop" end of plunger
47. 1/8" Ø shaft, press-fitted into drill-holes in the Mounting Wings (46)
48. 1/4" O.D. x 1/8" I.D. steel tube spacers on both sides of Spring member to prevent sideward motion of Spring
49. Recoil Spring (Specifications soon)
50. 1/4" Ø capscrew and nut anchoring the bottom end of the Recoil Spring (49)
51. 3/8" O.D. x 1/4" I.D. steel tube-stock welded to bedplate of frame
52. Nut member of (50)


ITEM "FC"
SCALE:- 1"=1"
21
4½"
22
33
4 5/8"
34
THE
39
40
1¾"
1"
45
46
49
50
THE MIRIASCOPE — FOR A
RECTANGULAR C.R. TUBE
REVISED


PLAN VIEW
MAIN DRIVE SHAFT DETAIL

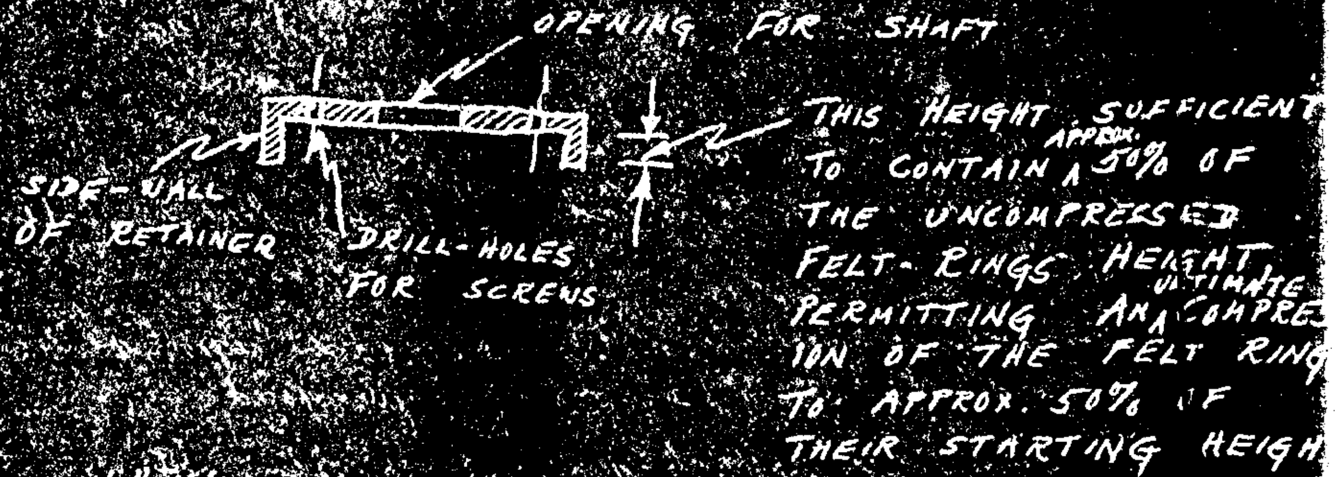


GRAB "B" DETAIL
C.R. TUBE
REVISED
PLAN VIEW
5
8
7
5
18
17
20
22
23
34
35



DWG. # 8 REVISED

1. Rim of 3/4" × 3/4" × 1/8" aluminum angle
2. Left-side of Inner Drum "End-Ring (R.H.). See Items "JB" & "JC"
3. Side-plate to which the axle member of each "support member" is anchored. See Item "JD". - 6 req., equi-spaced
4. For details of the spoke-to-rim joint, see Item "JB".
5. 3/4" × 3/4" × 1/8" aluminum angle spoke
6. Aluminum Hub-Housing. Fabricate from 4" aluminum round stock, or 4" O.D. × 1 7/8" I.D. tube-stock - if available
7. New Series 1600 - 1 7/8" shaft-size permanently sealed and permanently-lubed ball bearing
8. Aluminum or steel cover-plate
9. 1/4" × 3/4" flat hd. mach. screws - 6 req. on 3 11/16" D.S.C.
10. 3/4" × 3/4" × 1/8" aluminum angle rim, as per (1)
11. ditto (5)
12. 1/4" × 1 1/4" hex capscrew & nut - 2 req. per "support member"
13. axle portion of "support member" assembly, to be fabricated from mild steel bar stock. (13) in particular, refers to the roller-bearing portion of the axle
14. anchored portion of the axle member, see (13)
15. side plates of 1/8" × 11/16" × 1/2" plates welded to both legs of the rim angle as indicated
16. 3/4" × 3/4" × 1/8" aluminum angle rim
17. 10" × 1/16" flat hd. mach. screws - 6 req., threading into properly drilled holes in the top of (22)
18. Retainer Ring, of mild steel. A retainer with a side-wall to restrain the outward "creep" of the felt rings so they are compressed would, of course, be preferable. Such a Retainer would be as shown below:



19. $\frac{1}{8}$" thk. medium soft felt ring. 2 may be used to allow for a greater "area-of-contact" with the shaft
20. Output shaft of the Drive Motor
21. Keyway for $\frac{1}{16}$" x $\frac{3}{16}$" key between driving gear and the output shaft of the Drive Motor
22. 24 gage sheet steel, galvanized, metal member (22), which is formed to an approximately 380° surface-of-revolution of a line about the ℄ of the Motor-shaft, together with (30) forms the top half of the bath. The bottom edge of the 'top half' of the bath forms the male member of the joint between the 'top' and 'bottom' halves of the bath
23. 24 gage sheet steel, galvanized. Member (23), which is of the same shape as (22) for the most part, together with member (32) form the 'bottom' half of the bath. The top edge of (23) and (32) is flared to form the 'female member' of the joint between the 'top' and 'bottom' halves.
4. 50-tooth, $\frac{5}{8}$" face, 45° helix angle, 2.5" P.D., L.H., helical gear, steel
5. Housing for Sherlock Klozure. To be formed from 1$\frac{3}{8}$" O.D. x $\frac{7}{16}$" I.D. seamless S.A.E. 1020 steel tube-stock, and brazed

or welded to member (25).

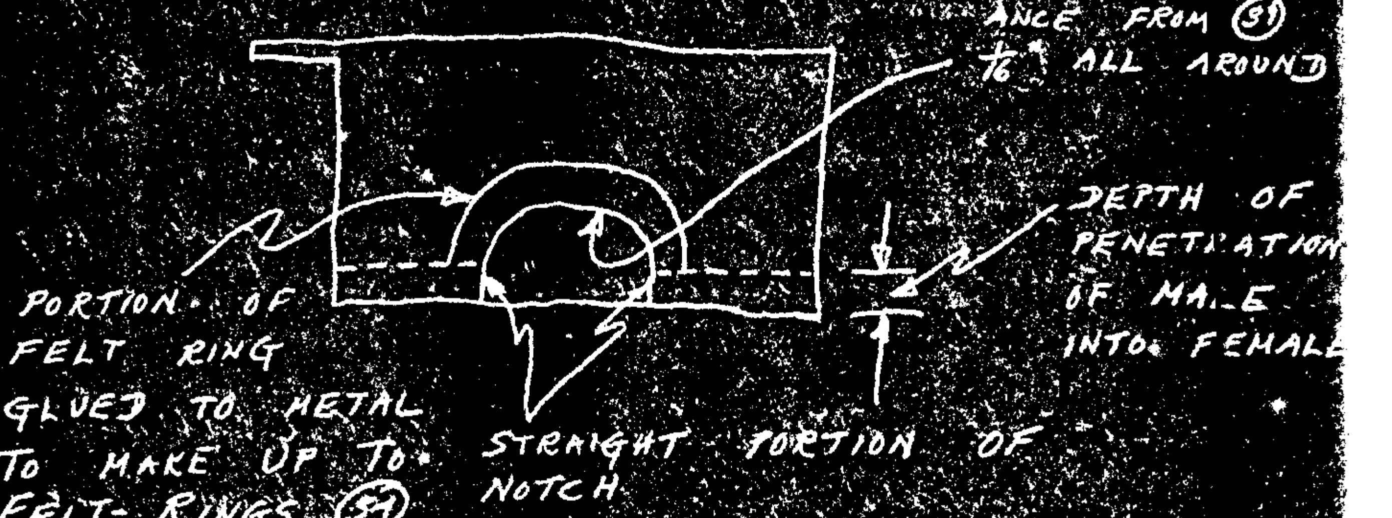
26. $\frac{1}{16}$" Ø x $\frac{3}{16}$" lg. rd. hd. mach screws — 6 req. on $1\frac{3}{4}$" D.S.C.

27. Garlock $\frac{1}{4}$" x $\frac{1}{4}$" double lip Klozure leather or felt seal

28. This end of shaft enters the Outboard Bearing on the Pad-plate

29. Key between driven gear and the Main Drive Shaft. Key is $\frac{3}{16}$" x $\frac{3}{16}$"

30. Member (30) is notched for the Main Drive Shaft as indicated below:



31. Main Drive Shaft. See Dwg. #7 REVISED. Though shown here as a solid shaft, the Main Drive Shaft is hollow in fact.

32. Member (32) is correspondingly notched for the Main Drive Shaft as in member 30, and a portion of a felt ring is similarly glued beneath the flare to make-up to the felt-rings (34).

33. $\frac{1}{16}$" Ø x $\frac{3}{8}$" lg. rd. head machine screws to draw-up on Retaining Rings (35).

34. Medium soft felt rings, each $\frac{1}{8}$" thk. or one $\frac{1}{4}$" thk, making-up to glued portions of rings above notch in (30) and beneath the flared portion of notch in (32).

35. Retainer Ring of sheet steel — 2 req., 1 each side of 30
36. 1¼" x 1¼" x 1/16" thk. aluminum angle rim of Outer-Drum End-Ring (L.H.).
37. ~~Drill~~ Hole-member of Grab "B"
38. Departure Block of Grab "B"
39. Plastic Drum (NOTE:- In the immediate vicinity of the hole 37, in the longitudinal as well as girth directions, a general clearance for the hole is used. The dotted extension of 39 indicates the normal overlap of 39 over 36.
40. The plunger-member of Positioner "B" which consists simply of a square-finished drill-rod instead of the ball-point assembly used in Positioner "A".

NOTE:- The normal oil level in the Oil Bath is indicated by the horizontal discontinuous line across the bottom of 32.

[illegible]

NOTES ON DWG.
#9

Since Pages 112-117 and Pages 201-210 were written, th
following changes have been made in Dwg. #9:- a) C16 has b
equipped with 2 N.C. load contacts instead of one N.C. set; b)
has been installed in the circuit, and (c), C18 has been in
in the circuit.

The extra set of N.C. load contacts in C16 provides for the disen
of C17 immediately after C16 engages. Thus, soon after C17 f
to introduce a time-delay between the achievement of black-and
alignment between the two Drums and the disengagement of Positi
the engagement of C16 leads not only to the disengagement of C8
C6 but to the disengagement of C17's operating coil as well. Th
no member of the black-and-white alignment section of the cir
functioning during black-and-white viewing.

The purposes served by C17 are commented on on Page 215 of
enclosed. [NOTE:- On Page 205, C17 is given as C18. P
note the change in legend]. Also please read Page 204 in th
connection.

The purposes served by C18 are commented on on Page 115 of the
enclosed. The method of guarding against the hazard raised
Note on Page 115 is inadequate and incorrect. The solution pr
by C18 is positive, since the setting of the Drive Motor into regu
color-viewing service definitely awaits the tripping of C18 b
plunger member of Positioner "A", and thus guarantees that
plunger pin is withdrawn from Grab "B" when the Drive M
is set into regular color-viewing service.

(in continuation)

onto the departure block of Grab "B"; (b) a gliding of the latch-pawl down the slope of the departure block; and, (c), in consequence of (b), a return of C5's actuator to its normal position.

With the return of C5's actuator to its normal position, a signal would be caused to course from power supply across the normally-closed set of contacts of C5, and then across a normally-open set of contacts in the still-engaged relay C9, to one of the normally-open sets of contacts of C14. X

C14, it will be recalled, like C13, remains engaged as long as C2 is in its "color" position and C15 is not engaged. Therefore, the signal originating at the normally-closed set of C5's contacts is relayed across the indicated normally-open set of contacts in the now-engaged C14 to pass across a normally-open set of load contacts in the now-engaged C and appears finally at the upstream-side of the normally-closed set of auxiliary contacts of C11. Here, the signal results in the engagement of C11.

The engagement of C11, by the closing of its normally-open ~~both~~ load contacts opens a path for a succeeding signal from the normally-open set of contacts in C5 to be applied to the normally-open set of auxiliary contacts in C12. Thus, when Drum #2, during the completion of the travel which is initiated when C12 engages, causes the latch-pawl to mount the approach block of Grab "A", the actuator of C5 is tripped and a signal is caused to course from the downstream side of the normally-open contact of C5 across the normally-open set of load contacts in the still-engag C7, and then across a normally-open set of load contacts in the still-eng C9, to the upstream side of one of the normally-open sets of contacts of the conventional relay C14. Since C14 is still engaged, this signal is then relayed across a normally-open set of load contacts in C11 to wind up ultimately at the upstream-side of the normally-open set of auxiliary cont of C12. The application of this signal to the mentioned set of auxiliary conta causes an energizing of the disengaging section of the operating coil of C12, a resultant disengagement of C12. Accordingly, the power signal to the drive-motor is interrupted, and, in net effect, the motor is disengaged just as the latch-pawl mounts the ~~up~~ slope of the approach block of Grab "A". The engagement of the latch-pawl in Grab "A"'s grab-slot is then accomplished on the basis of the residual momentum of Drum #2

SENDING THE COLOR-VIEWING-ALIGNED DRUMS INTO ACTION:-

Once the latch-pawl drops into Grab "A"'s slot, the actuator member of C5 returns to its normal position, and, with C12 in its now-disengaged position and C11 in its still-engaged position, a path is opened for a signal from the downstream side of the normally-closed set of contacts of C5 to the operating coil normally-closed set of auxiliary contacts of the mechanically-held relay C15. The application of the mentioned signal to the normally-closed set of auxiliary contacts of C15 leads to the engagement of C15. The signal which accomplishes this task proceeds from the downstream side of the normally-closed contacts of C5 across a set of normally-open contacts in the still-engaged relay C9 to the upstream side of a normally-open set of contacts in the conventional relay C14. From this point, it travels across the mentioned set of contacts in the still-engaged C14 to a normally-~~open~~ closed set of contacts in the ~~still~~ now disengaged mechanically-held relay C12, from which point it is relayed to a normally-open set of load contacts in the still-engaged C11. The still-engaged C11 permits the mentioned normally-open set of load contacts to convey the thus-relayed signal to the upstream-side of the normally-open set of auxiliary contacts of the mechanically-held relay C15. As indicated above, the eventual travel of the signal to the normally-closed set of auxiliary contacts of C15 leads to the energizing of the engaging section of the operating coil of C15, and hence to the engagement of C15.

For its part, the thus-accomplished engagement of the mechanically-held relay C15 leads to:-

a) the application of a maintained and continuous energizing signal to the Drive Motor

b) the discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14

and,

c) the sending out of a "disconnect signal" to C9 and C7

The discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14 according to (b) above takes place via the opening of the normally-closed set of load contacts in C15 when C15 is engaged. The discontinuation of phase supply to C13, the solenoid member of Positioner "B", means the retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B". This retraction of the plunger-member (see Dwg. #9) takes place under the action of the recoil spring member of the Positioner assembly. The retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B" clears the impediment to the Drum Assembly's going into action which the energized Positioner Constitutes. The simultaneous discontinuation of phase supply to ~~Positioner "B"~~ the conventional relay C14 means the de-energizing of C14, and the breaking of the paths whereby the 'activating' signals for C11 and C12 are transmitted.

The application of a maintained and continuous energizing signal to the Drive Motor according to Item (a) above is accomplished by the 'making', or closing, of a normally-open set of load contacts in C15 when C15 engages. As noted above, since the plunger-member of Positioner "B" is withdrawn from the drill-hole member of Grab "B" simultaneously with the application of the energizing signal to the Drive Motor, both conditions for the sending of the Drum Assembly into action are accomplished with the Engagement of C15:-

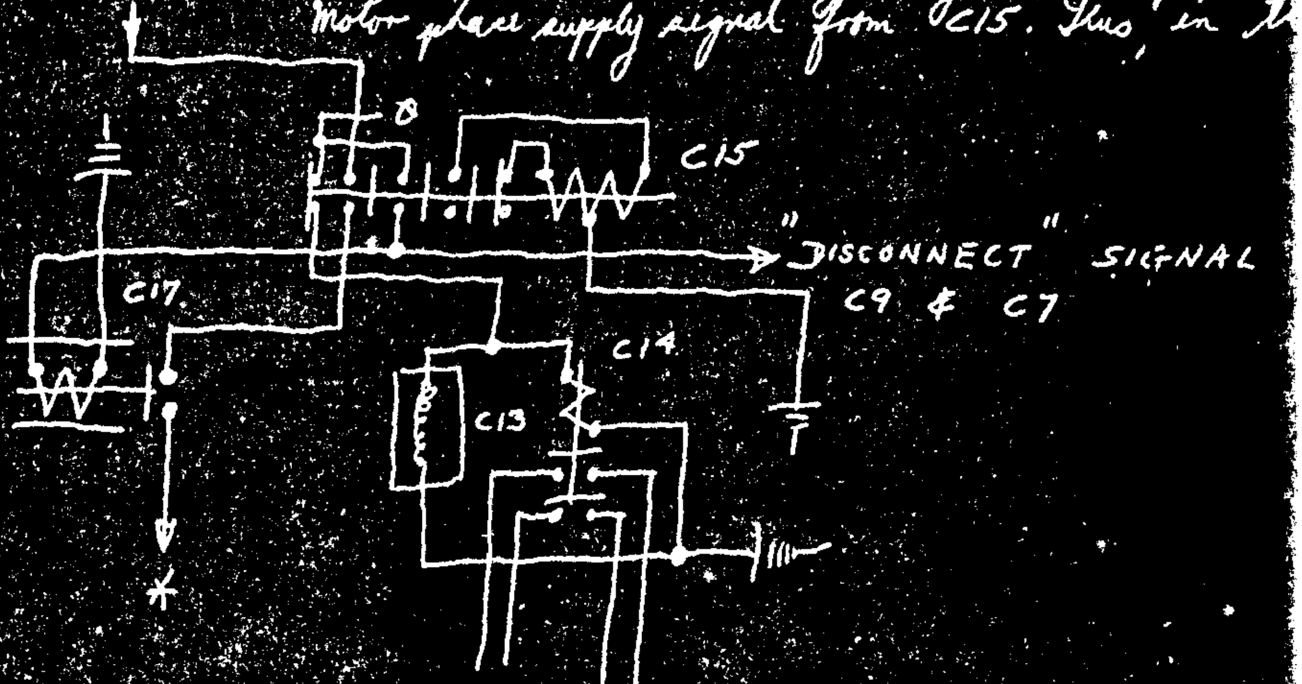
1. the plunger-member of Positioner "B" as a holdin
agency against rotation of the Drum Assembly is
removed

and

2. the continuous power supply for the Drive Motor which is requi
for its operation in color-viewing is supplied.

NOTE:- The simultaneity of action which C15 establishes between
retraction of the plunger of C13 and the energizi
the Drive Motor raises the question as to whether
slowness of the recoil action of plunger assembly cou
result in a jamming of the plunger in the drill
of Grab "B" and a possible consequent stalling
motor. To forestall such an eventuality, it mig
best to place a time-delay relay in the path
Motor phase supply signal from C15. Thus, in th

PHASE SUPPLY TO DRIVE MOTOR



shown below, the on-delay timing relay C17 would
the application of the energizing signal to the Driv
for a sufficient period of time to guarantee the r
of Positioner "B"'s plunger from the drill-hole of Gra

thereby eliminating of question of jamming of the plunger or stalling of the motor.

Now, let us return Item (c) above, namely the 'disconnect' signal to C7 and C9. [NOTE:- Observe that in the sketch given above a 'tap' off the signal to C7 and C9 is used to activate the on-delay timing relay C17]. By its very nature, the 'disconnect' signal to C7 and C9 is a 'clear-the-board' signal which readies the "black-and-white alignment" section of the control circuit for its next call to action. This 'disconnect' or 'clear-the-board' signal is accomplished via the closing of a normally-open set of load contacts in C15 when C15 is engaged.

In connection with the 'clear-the-board' signal from C15 to C7 and C9, it might be well to point out that a 'clear-the-board' signal for the case of the mechanically-held relay C16 is provided via a 'tap' from the color-position contact of the 2-position selector switch C2. Thus when the 2-position selector switch C2 is turned to its color-position, C16 is 'cleared' for its next service in the functioning of the "black-and-white alignment" section of the control circuit. No activation of any portion of the "black-and-white alignment" section of the control circuit follows from this since the turning of the selector switch C2 to its color-position perforce removes phase supply from the "black-and-white alignment" section of the circuit.

Finally, it should be observed that the 'clear-the-board' signal for the "color-alignment" section of the circuit [in particular for the C15 and C11 components thereof] is obtained by a 'tap' from the black-and-white position of the 2-position selector switch C2. Thus, simultaneously with the next calling of the 'black-and-white' alignment section of the circuit into action the rotor-alignment section of the control circuit is readied for its next call to duty.

ERRATA, ADDENDA, & COMMENTS

RE: PAGES 1-27, THE MIRIASCOPE

PRINCIPAL DIFFERENCES BETWEEN THE ORIGINALLY SUBMITTED DESIGN & THE DESIGN SET FORTH ON ~~Pages~~ DWGS #1-9:-

The original outlines of the Miriascope were set forth in a series of Preliminary Sketches numbering 19 sheets of which the last was devoted to a proposed Control Circuit. The balance were devoted to detail aspects of the design. The original design, its objectives, its fundamental principles, and its detail aspects were discussed in a 27-page document beginning with an untitled communication dated 9/6/51. Later, a series of 9 formal drawings were submitted which in many aspects differed from the originally-submitted drawings (sheets 1 thru 19). These differences are for the most part in the detail aspects of the design rather than in fundamental principles.

* * * * * * * * *

NOTE: In the series of drawings numbered #1-9, it will be found that successive drawings in dealing with any given detail may differ. Such differences when they occur between succeeding drawings are intentional, and are meant to convey revisions of the design as given in previous drawings. Therefore, any and all conflicts between successive drawings are to be construed in favor of the drawing bearing the most recent series number.

IMPORTANT

* * * * * * * * *

Positioner "A" via a normally-closed set of load contacts in the mechanically-held relay C16; while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay; while on Sht. #19 it appears as a conventional relay;

c) on Dwg. #7, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 2 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.O. unit, and C7 as 1 N.O. - 1 N.C. unit;

and,

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (a) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the Drums for "black-and-white" viewing has been achieved. By so doing, any A.C. chatter associated with the continued engagement of C6 [the solenoid member of Positioner "A"] and C8 [the on-delay timing relay] is eliminated; and, further, any disturbing effects due to ~~the~~ a continued feeding of these equipment items is eliminated.

Associated with the addition of C16 to the "black-and-white alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specifications for C9. From a reading of pages 101-111, it will be observed that:-

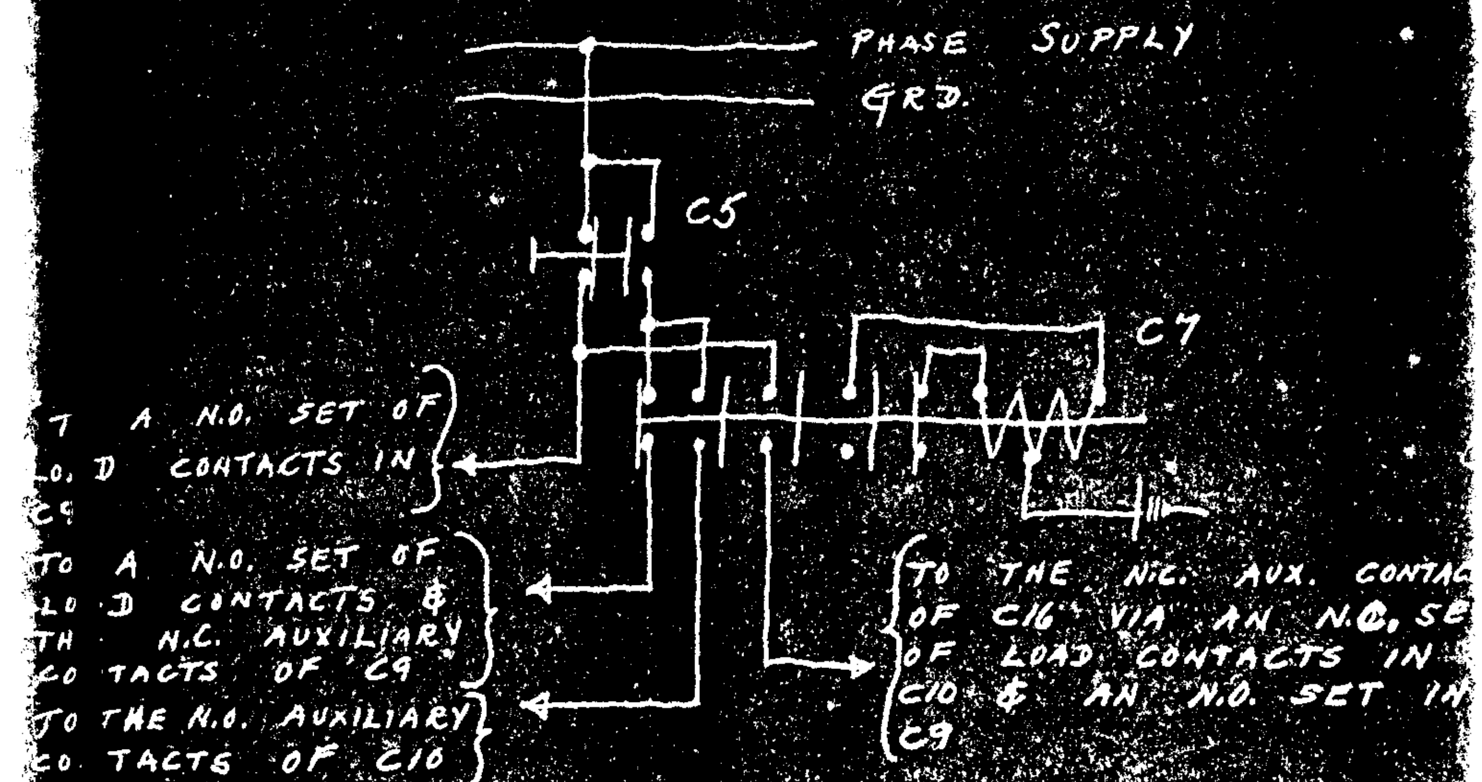
A. when the arresting of the Drum Assembly and the disengagement of the latch-pawl from Grab "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing, C9 is ~~also~~ engaged;

B. after C9 is engaged following the events mentioned in (A), C10 is engaged;

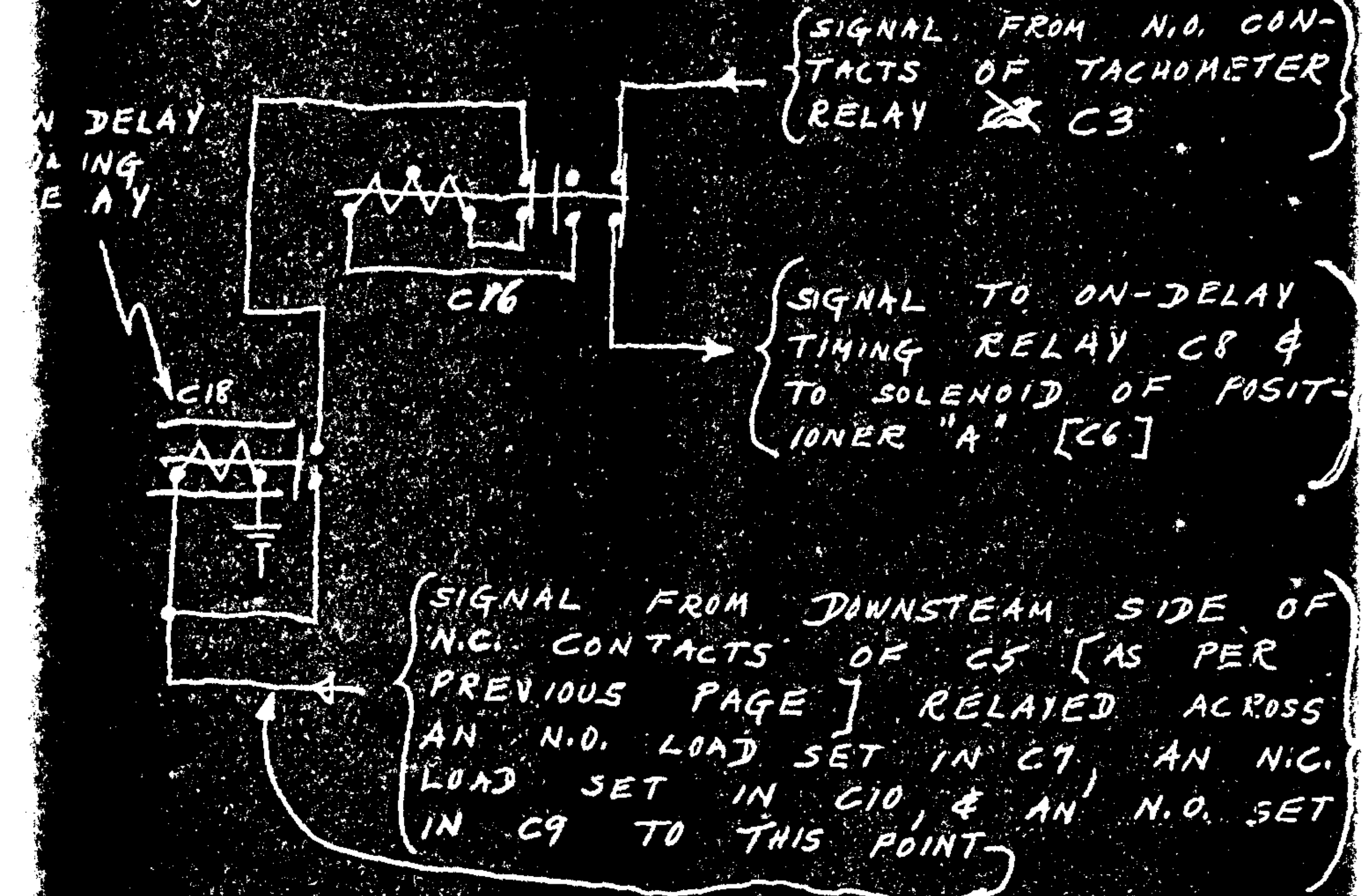
and, C. after C10 is engaged as a consequence of the engagement of C9 and after the ensuing motivation of Drum #2 alone results in the return of the latch-pawl to a position where it no longer trips the actuator of the Peanut Limit Switch, C7 is engaged

Studying the Miriascope Control Circuit as given on Dwg. #9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal starting from phase supply, and, after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the opened path, namely that C7 and C9 be engaged while C10 be disengaged, are fulfilled as a sequel to item (C) above. From pages 101–111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch C5. This signal which is transmitted across a normally-open set of load contacts in C7 to the normally-open set of auxiliary contacts in C10 occurs when the latch-pawl of Drum #2 has already mounted the approach block of Grab "B" during this Drum's travel towards its black-and-white viewing required position. It will also be found in the "Description....", pages 101–111, that the mounting of the approach block of Grab "B" by the latch-pawl member of Drum #2 is followed shortly thereafter by a locking of the latch-pawl

in the grab-slot of Grab "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slat of Drum #2 with a clear slat in Drum #1 for the purpose of black-and-white viewing. Thus, since the signal which which engages C16 (and consequently disengages C6 [the solenoid of Positioner "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be ~~possible~~ practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This scheme is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-isolating action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. This means as well that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' would be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the drill-hole of Grab "A". If this were done, then a way of doing it would be as indicated below:-



Of the matters raised on page 202, only one has thus far not been discussed, and this is Item (b) dealing with relay C15. On Sk. #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg. #9, it appears as a mechanically-held relay. Two reasons underlie the change, of which the first is the more important:-

1. Sk. #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C5, is transmitted across an N.O. load set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. load set in C12 to an N.O. set in C11, and, finally, is then applied to the plase-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, that C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color-viewing. However, since ~~C14~~ the engagement of C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement of C14, which would in turn lead to the secondary disengagement of C15 —— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg. #9;
2. the second reason lies in the inadvisability of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. chatter and electrical disturbances to the operation of the TV circuit are possible. By making C15, a mechanically-held relay the permanent engagement of C15 prior to

the disengagement of C14 is assured, and, once, the engagement of C15 is established, it holds that engagement without any further feed of power. The latter fact satisfies the above-mentioned conditions that no member of the switching circuit be capable of "chattering" or demand a continued feed of power during any viewing cycle, other than — possibly — the Tachometer Relay.

As C15 is now specified, its engagement follows the completion of the drums-re-alignment action, for the engagement signal is transmitted along the following path:

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the latch-pawl of Drum #2 must be in its "low" position;

b) the signal as of (a) is relayed across a normally-open load set in C9, which means that C9 must be engaged — and this condition is satisfied since C9's position is reversed only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. load set in C9 to the upstream side of an N.O. set in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged as long as C2 is in its [illegible] position and C15 is disengaged;

d) the signal as of (c) is applied from the downstream side of the N.O. set in C14 to the upstream side of an N.C. set in C12, which means that C12 must be disengaged for the further relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum # 2 is brought to a given state of 'lift' by the approach block of Grab "A"

and,

e) the signal as of (d) is relayed from the downstream side of the N.C. load set in C12 to an N.O. load set in C11, which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum # 2 past the departure block of Grab "B" during the travel of Drum # 2 towards its color-realigned position with Drum # 1, and further C11 maintains its engaged position until the next black-and-white following alignment is signalled.

The signal as of (e) is then applied to C15. Since the 'lift' of the latch-pawl by the approach block of Grab "A" imminently precedes the locking of Drum # 2 into the color-alignment position with Drum # 1, it follows that C15 is engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the Control Circuit given on Page 115, it would follow that C15 would ~~[illegible]~~ engage to release Position 3, disengage C14, and restore C9 and C7 to their disengaged positions, only after the color-alignment of the two drums has been achieved.

Thus Item (b) on Page 202 is explained.

TWO IMPORTANT CONSIDERATIONS:

Two important considerations underly the projected design [of the] Control Circuit. These are:-

(a) the type of mechanically-held relay used

and (b) the circuitry which the release of Position "A" [in] black-and-white alignment has been achie[ved].

It has been repeatedly set forth above that one of the function[s] served by the use of mechanically-held relays was to elimina[te] chatter and extraneous electrical disturbances to the operation of the TV circuit while the functional demands on any given relay d[uring] its continued engagement. This set of qualifications more or [less] defines the type of relay which is required. Explicitly, it wo[uld] be required that:-

(a) The holding of the relay's engaged position be accom[plished] either by a mechanical or a magnetic latch

and (b) a second operating coil which overcomes the mechanical or magnetic latching action be a pa[rt of] the relay.

Mechanical latches for the holding of relays in their engaged po[sitions] are extremely common, and in fact, the name — mec[hanically-] held relays — is derived from the original use of such m[echanical] latches. More recently, it has been common to replace mech[anical] latches by permanent magnets which hold the relay-plung[er when] the plunger is drawn against the permanent-magnet pole-fa[ce. The] latter type of construction, which has been referred to as a m[agnetic] latch, is preferred here, since strictly mechanical latches a[re] subject to imperfect operation when the baseboards to which [they] are attached are jarred.

Finally as regards the mechanically-held relays u[sed] should be observed that to assure the best operation of such a relay, the two operating coils of the relay — the one which acts to engage the relay, and the other which acts to disengage or de-latch the relay — should be signalled thru auxiliary contacts which are operated in common with the load contacts. The contacts which are auxiliary to the engaging action — the N.C. auxiliary contacts — should have a 'dragging effect' incorporated in them to assure the completion of the engaging stroke against a spurious or chattering 'making' action.

If the construction schedule for the models permits, I will design a set of relays suited in size and other characteristics to the demand of the Control Circuit.

On the subject of the decision to disengage Positioner "A" after black-and-white alignment of the Drums has been achieved, it has been held here that the inertia of the Drum Assembly and the Drive Motor rotor, plus the friction forces between the gears constituting the power transmission, would be sufficient to hold any previously established position once the desired Drum Assembly alignment and positioning in front of the cabinet window has been achieved. The further argument that a continued energizing of the Positioner solenoid might lead to 'chattering' and also to electrical disturbances to the T.V. circuit's normal operation led to one of two solutions:-

* A. either construct the Positioner solenoids along mechanically-held lines;

or,

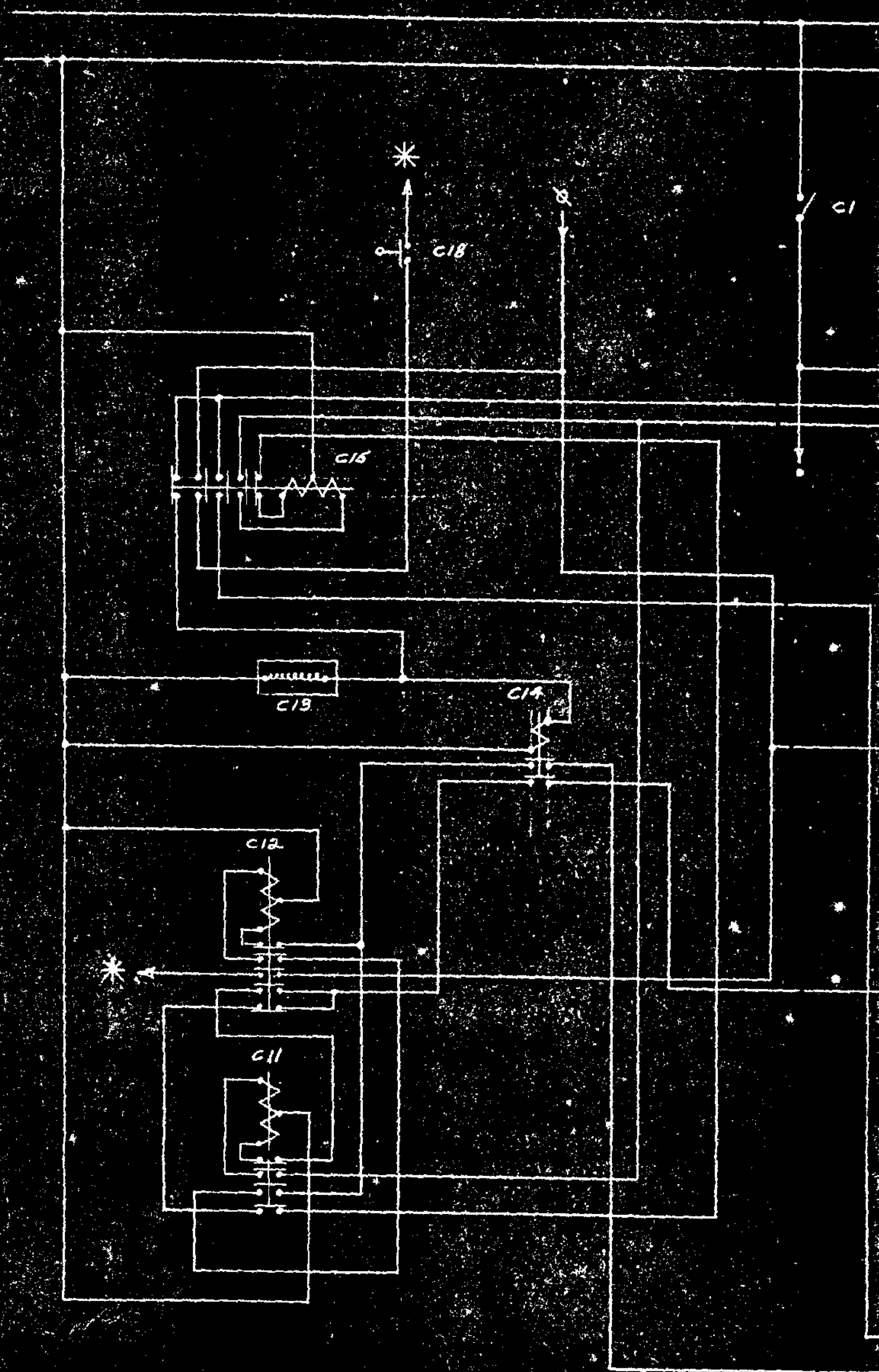
B. hold any given Drum Assembly position on the basis of the inertia and friction forces named above.

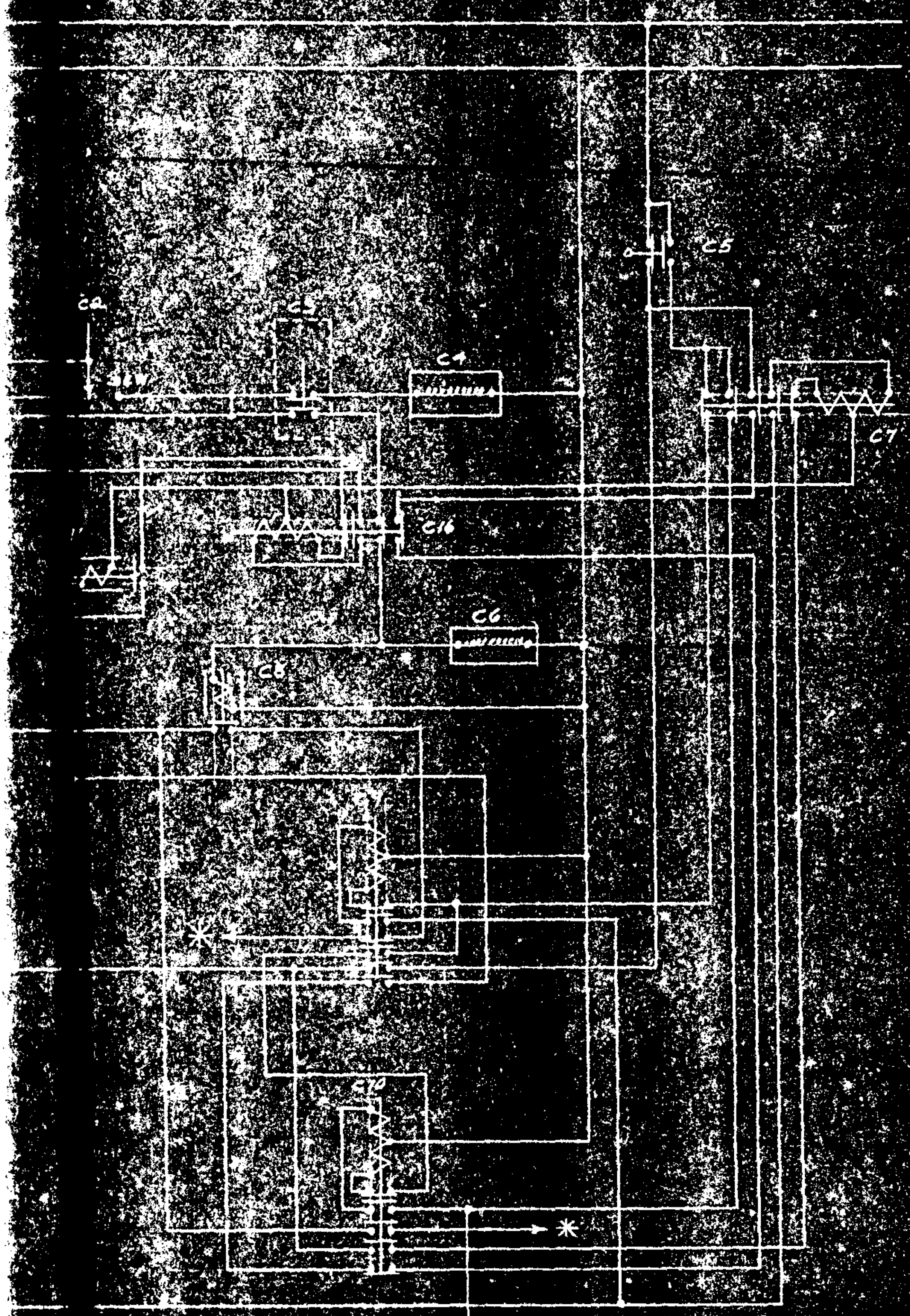
The latter was chosen for the reason of the costs involved in the former alternative.

* NOTE:- Will [illegible] 205

THE MIRIASCOPE CONTROL CI

DW




C2
C3
C4
C5
C7
C16
C6
C8
C10

[illegible]

[illegible]

[illegible]

[illegible]

The principal design provisions set forth by Dwgs. # 1-9, as referred to Sheets # 1-19, are the following:-

A. THE DECISION TO GIVE INNER DRUM END-RING (R.H.) A "DOUBLE SUPPORT":- Dwg. # 8 in its "DETAILS "J"" indicates that the Inner Drum End-Ring (R.H.) is to be a spoked ring, with its spokes attached at one end to a central hub and at their other end to an angle rim. "DETAILS "J"" further indicates that the rim bears "support members" which ride on the inner side of the Outer Drum End-Ring (R.H.). The "double support" for the Inner Drum End (R.H.) in this case can then be said to consist of:- a) the spoked construction which supports the ring from the Stationary Shaft (Detail "O"); and, (b) the "support members" construction which supports the ring from the Outer Drum End-Ring (R.H.).

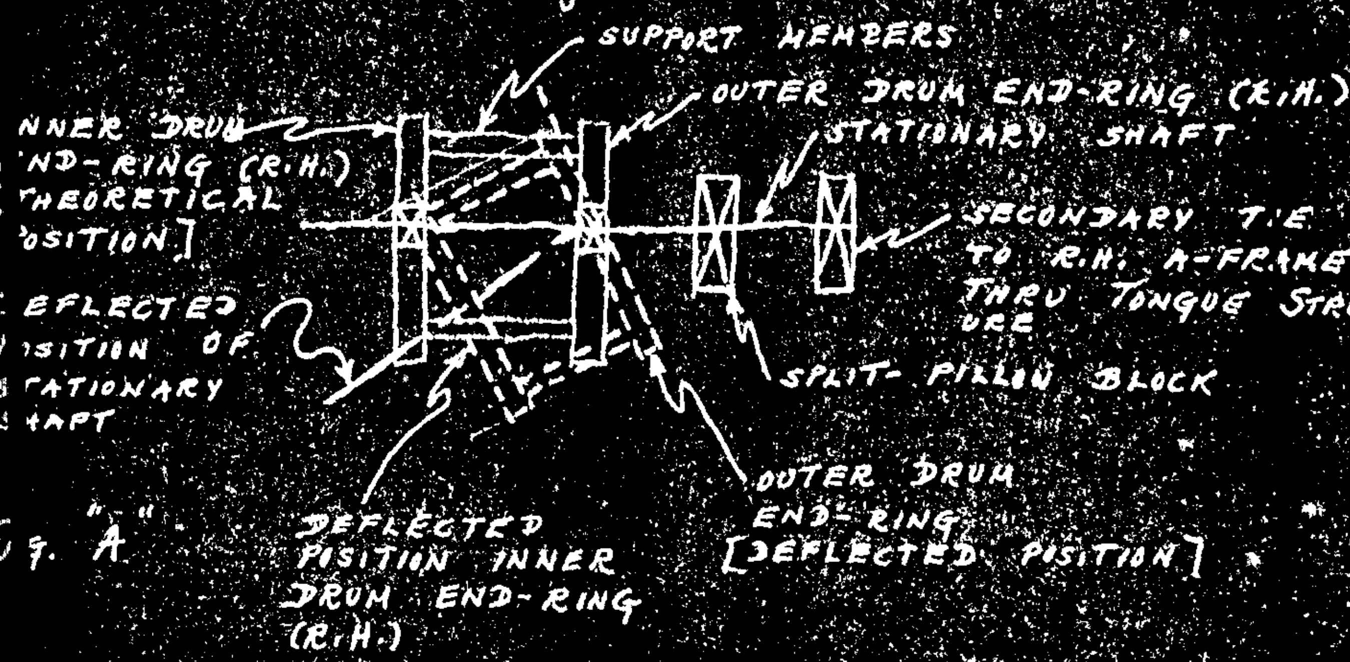


Fig. "A".

Fig. "A" sets forth the operative principles of the assembly which is obtained via the "double support" arrangement. It will quickly be seen that the "support members" (See Dwgs. #1 & 6) are a means of assuring "squareness" between both rings and the Stationary Shaft about which they rotate, in that they (the "support members") establish a "parallel" alignment between both rings (as they are related to one another). Thus, if either of the rings were to depart from its theoretically "square" geometrical relationship to the principal axis of the shaft, the "support members" would force the other ring into a parallel alignment to the first, and, thru the spoke support structure of the second, the second ring would communicate the slope of the deflected shaft at the first ring to the point at which the second ring is "anchored".

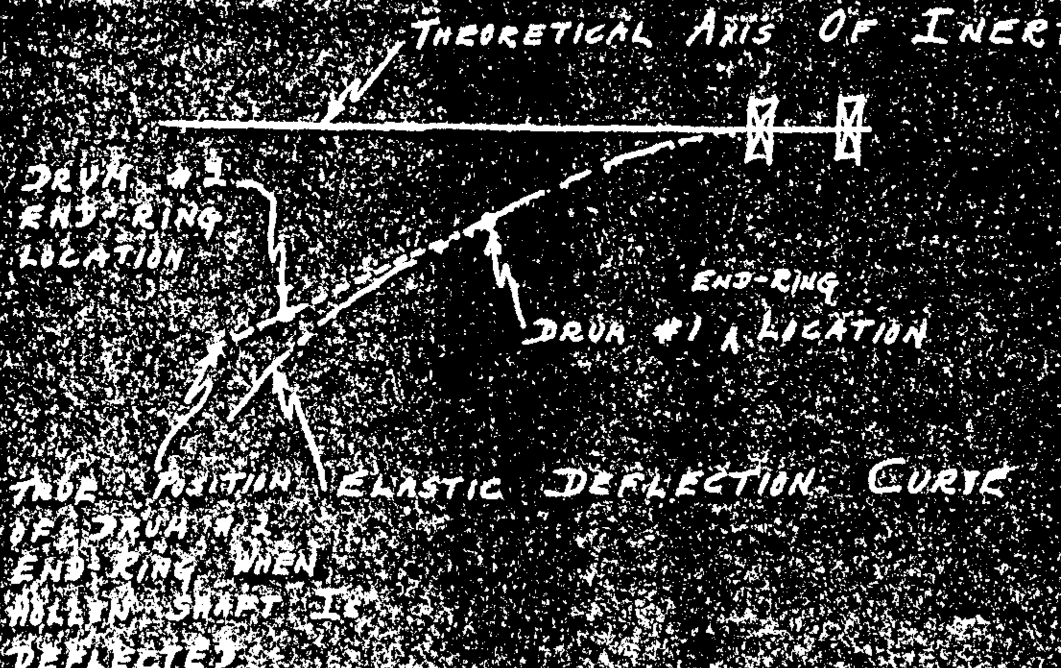
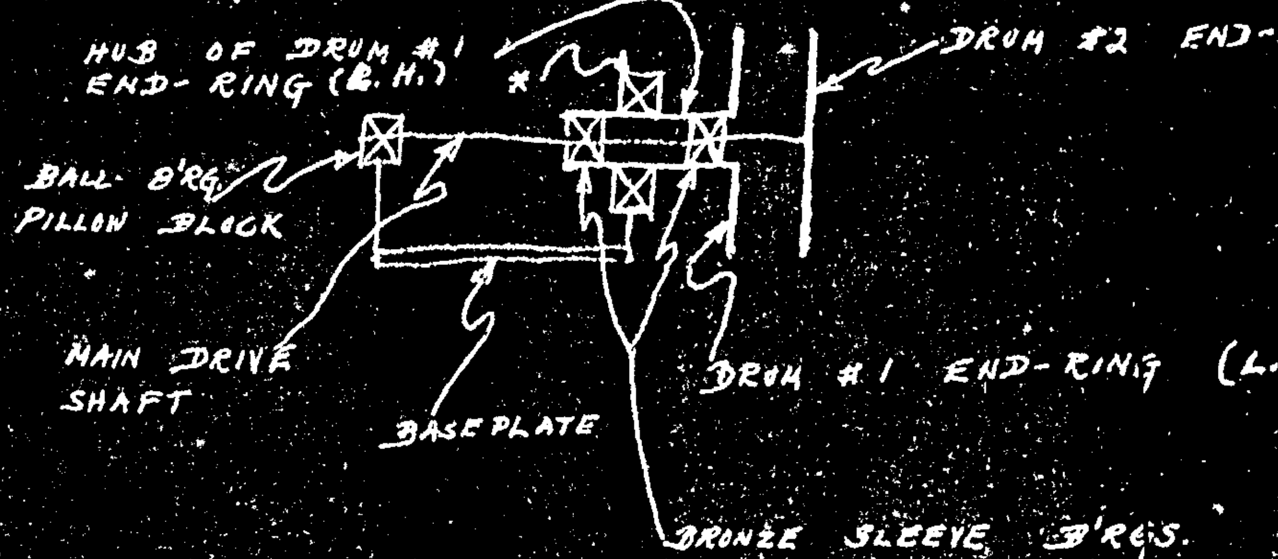


FIG. "B"

Fig. "B" illustrates the thought expressed above, and establishes that, if the Stationary Shaft is a sufficiently stiff member, the R.H. End-Rings as an assembly would be a stable one. Having arrived at this conclusion, it [illegible] R.H. End-Rings [illegible] illustrated the [illegible] used on the L.H. side ;—



* BALL B'RG
PILLOW BLOCK

FIG. "C

Observing Fig. "C", it is clear that the Bronze Sleeve
are a means of preserving a parallel alignment betwe
two indicated End-Rings. Once this is clear, it
that if the thus-aligned rings are now adequately
as an assembly the stable independence of the L.H.
Assembly is an established fact. The two ball-bearing
block units provide this support for the assembly as
whole.

Thus, it will be seen that both the R.H. and the L
Rings-Assemblies form individually stable, and independe
devices. Each draws its fundamental stability f
A-frame on which it is mounted. And so, if
connections between the two A-frames are made
a manner that the two A-frames are integrated
a stable and stiff composite structure, it will
that little if any of the responsibility for the generat

of the Miniscope as a whole would be imposed on the slats comprising the Drum Assemblies. In fact, the sole load imposed on the Drums would be transmission of the accelerating and the braking torques to the R.H. Ring-Assembly. The narrowing down of the structural and dynamic functions of the Drums to the ones which have just been cited makes it feasible to adopt the following lines of assembly and maintenance:–

i. in assembling the Miniscope, it is possible to establish a sequence in which the two A-frames and their inter-connecting members are first put together to form the prime structure. Next, each of End-Assemblies of the device should be assembled onto each of the A-frames. This should then be followed by a mounting of the C.R. Tube and its auxiliaries on the Mounting Plate (See Dwg. #4) and a connecting of these members to the appropriate leads in the cable coming thru the Hollow Shaft Member of the Mounting Assembly. With the foregoing having been accomplished, the slats for the Inner-Drum, and later the slats for the Outer Drum, should then be fastened onto the appropriate End-Rings to yield a fully-assembled unit which is then placed in the Cabinet.

and, ii. in the replacement of the C.R. Tube or in checking the leads to the tube and its auxiliaries, this will be done by removing one or more adjacent slats in both Drums to get at the Tube Mounting Plate. The slats which may be removed for such purposes might best be clearly indicated by some special marking on the non-viewed ends of the slats.

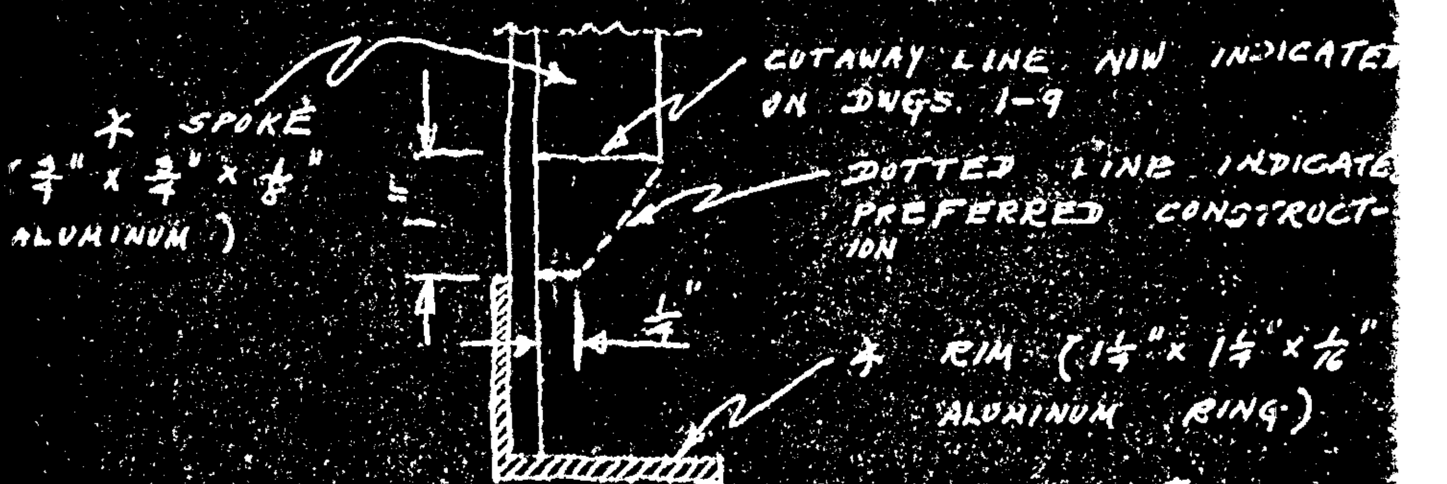
It will already be surmised from what has already been said on the assembly and the maintenance topics that the "welded longitudinal seams which between slats which Dwg. #1 sets forth [and which were similarly set forth in the earlier Sheets #1-19] are to be abandoned in favor of an individual fastening of each slat to the appropriate End-Rings, with each slat remaining an individually constituted member not otherwise connected to its adjacent slats than by the "ring effect" of the End-Rings. As to the fit of each slat to its next adjacent slats, more will be said in the comments which are to follow on the fabrication of the slats themselves. It therefore just remains to say that as a result of the "double support" principle which has been built into the R.H. End-Rings Assembly and because of the mutual parallel axis alignment feature which has been built into both End Rings-Assemblies, no reliance is now made on the Drums themselves towards the stiffness of the assembly as a whole; and the comments in this regard which appear on Pages 7 & 8 of the communication of 7/6/51 are therefore to be disregarded.

3. THE SPECIFIC DESIGN OF EACH OF THE END-RINGS:- In Dwgs. 1-9, the rim members of the End-Rings have been specified to be of angle members, rather than the types of rims specified in Sheets #1-19. In the case of both Outer Drum End-Rings, the spoke formation has also been altered over that previously given. Concerning the End-Rings rim members, the choice ~~was~~ of an angle section over the simple rectangular section previously indicated on Sheets #1-19 was dictated by the desire to give all of the rims a greater stiffness to out-of-roundness distortive influences. Moreover, the use of an angle shape in the case of both Outer Drum End-Rings contributes towards the ability to employ spoke formations which would otherwise not be possible.

The shifting of the dependence of the structural (i.e. static) and dynamic soundness of the unit as a whole from its previous base in the 'complete cylinder effect' of the Drums to its later base in the metal parts of the assembly was the principal motivating factor in going to an angle section for the rim. Both the fact that the angle shape is a stronger form and the necessity (from the standpoints of ease of assembly and maintenance) for shifting from a dependence on the Drums for a weighty contribution to the strength and soundness properties of the assembly need no further discussion. Let us turn therefore to the way in which the angle rims have contributed to other aspects of the construction.

The 'other leg' of the angle rims employed, it will be seen, has served as:- a) a mean of securing of firm joint between the rims and the spokes; and, (b) a means of anchoring such gadgetry as the support plate for the recoil spring and the limit switch components of the latch-pawl device (on the L.H. Inner Drum End-Ring) and the side-plates to which the the support axles of the "support members" are attached (in the case of the Inner Drum R.H. End-Ring). Specifically on the questions of both Outer Drum End-Rings, the inner surfaces of the rims must be 'clear' for the movement of gadgetry associated with the Inner Drum. This necessitates, in both instances, that one leg of the angle spokes be cut away to provide the necessary freedom of movement. The fact the Outer Drum End-Rings rims are formed of an angle section make it possible to provide the necessary cut-away without risking a wobbling of these rings due to a weakening of the spoke, since the stiffness of the rim can be held to be transmitted in part to the one remaining leg (of the cutaway spoke). ~~by which the rim is tied to the hub member of each ring.~~ Here, the fact that the remaining leg is welded along all of its 'lines-of-contact' to the side leg of the rim, and the inherent strength properties of the residual span of the cutaway length of the spoke, combine * to draw on the angle rim for a stiffness which could not otherwise be expected for the cutaway length.

A preferred construction in regard to the spokes-to-rim joint for both Outer Drum End-Rings would have been that shown below over that indicated in Dwg. 1-9:-



In any case, the use of angle spokes in the interiors of both Outer Drum End-Rings in the place of the constructions indicated in Dwgs. 1-19 which call for the use of channels tied into relatively complicated joints with each rim, is a move in the direction of space-saving and a more rigid construction for the overall rings. The use of an angle section for the End-Rings rims and the use of angle spokes tied into simple but stiff joints with the rims and hubs of the Ring-Assemblies is in fact a part of the general conclusion that the plastic Drum per se should not be depended on for any substantial contribution to the stiffness of the overall assembly.

III. THE CHANGES IN THE SPECIFICATIONS FOR THE BEARINGS:- Inspecting Dwg. 1-4, it will be [illegible] that anti-friction bearings have been used wherever the members-in-relative-motion are involved in roller-bearing (that is, wherever the members-in-relative-motion experience duty for substantial periods of time); and, where the members-in-relative-motion experience duty only during Drum-realignment, these bearings have been specified to be sleeve-type bearings of the "porous bronze" type. Thus, the bearing between the Stationary Shaft and the Outer Drum End-Ring has been changed from the construction shown in Sheet #1-19 to an anti-friction bearing in Dwgs. #1-9. With regard to the Stationary Shaft-to-Outer Drum End-Ring bearing, it is well to point out that the [illegible] that the assurance of "squareness" with the Stationary Shaft, which the construction shown on Sht. #12 would have contributed, is accomplished in the case of the presently-indicated construction by the Double-Support Effect between the two R.H. End-Rings as was noted above. The reasoning behind the preference for anti-friction bearings when prolonged bearing duty is involved is of course obvious.

B THE DESIGN OF THE "SUPPORT MEMBERS":-

On Sheet #11 of the originally submitted Sketch Sheets, "bearing arms" of [illegible]-methacrylate were proposed. These were to be attached to a at-that-time proposed plastic end-ring [illegible] of the same material for the R.H. side of Drum #2. These "bearing arms" were to ride on the inner surface of the R.H. Outer Drum End-Ring, and to play a part not different from that now proposed for the "support members" on Dwg. #1 of the series Dwgs. #1-9.

The presently-proposed "support members", which involve a roller action on an axle attached to the Inner Drum R.H. End-Ring, were substituted for the originally-proposed "bearing arms" because they are capable of taking a larger load and also because over a long period of time the presently-proposed "support members" would require less maintenance and would be more noise-free.

E. THE LATCH-PAWL MECHANISM ALTERATION:

IMPORTANT PLEASE NOTE

Before discussing the alteration in the design of the latch-pawl, it would do well to point out a revision which should be made in the design now projected on Dwg. #1 of Dwgs. #1-9. As presently indicated on Dwg. #1, it would appear as if the 'unloaded' position of the latch-pawl would involve its hub member seating on the floor of the Outer Drum L.H. End-Ring. This should be altered so that the relaxed position of the spring (53 on Dwg. #1) controlling the pawl's position keeps the pawl about 1/16" off the mentioned floor. This would mean that there would be no scraping action by pawl's hub on the floor of the given End-Ring when Drum-realignment occurs; and, yet, the engagement of the Gait-slot of either Gait would not be ill-affected as to the positiveness of engagement between the two Drums.

With the slight modification of the design shown on Dwg. #1, it is clear that the only 'contact' between the latch-pawl and L.H. End-Ring of the Outer Drum would occur when:- (a) the two Drums are engaged; and, (b), when the latch-pawl mounts the slope of either Gait's approach-block. For the case where action (b) occurs, the rubber-covered roller on the shank of the pawl would give a noiseless rolling action whereas the design originally submitted on Sketch Sheets #1-19 would involve a scraping action between the latch-pawl and each approach block."

and,

F. THE SPECIFICATIONS FOR AND THE FABRICATION OF THE SLATS:-

The originally-submitted bill-of-materials and the document of 7/6/51 called for the use of 1/16" methacrylate sheet of clear, saturated blue, saturated green, and saturated red colors.

At the time, these specifications were laid down it was the erroneous understanding of the writer that polymethacrylate sheet of the correct optical filter properties is available. This is apparently not true. It now appears that true colors depend on the use of filters of tight optical specifications. Against this latest information, it would appear that the optimum construction for the filter-slats would consist of Wratten Blue 47, Wratten Green # 58, and Wratten Red #26 filter sheets sandwiched in clear optical gel, unwrinkled and uncreased form between two 1/16" thk. poly-methacrylate sheets preformed to the specified curvatures. [NOTE:- At a later date, some experimentation in the deposition of filter gelatins on one of the two methacrylate sheets forming each composite slat would be in good order, and instructions in this regard will be furnished.]

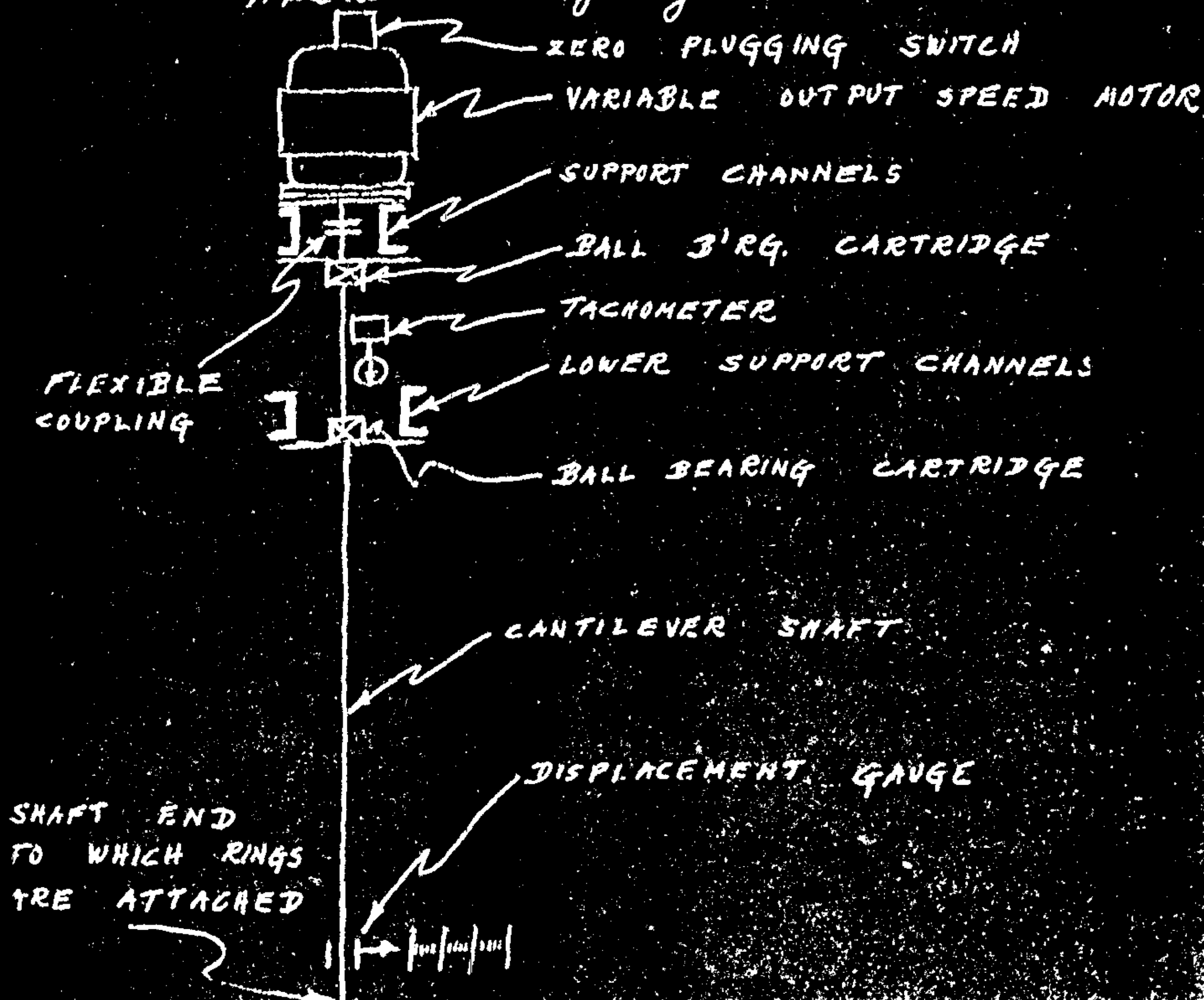
As to the composite slat so defined above, the adjacent longitudinal edges should be so finished off that tight, square fits between the slats are possible. In the case of the clear slats, two slats of 1/16" thk. polymethacrylate sheet should be employed encasing a balancing* sheet of clear cellophane should be used. [* Balancing here means balancing the ~~filter~~ Wratten color filter sheets used in the color filter slats]. No bonding, so previously indicated, between the longitudinal slat joints will be necessary. Each slat made up as above outlined is to be independently attached to the appropriate End-Rings.

THE PRINCIPAL ASSEMBLY PROBLEMS:-

The proper operation of the Microscope as it is now projected depends on the following critical factors:-

I. THE PROPER BALANCING OF EACH OF THE END-RING UNITS:- Quite obviously at least two of the End-Rings [the L.H. End-Rings of the

Inner and Outer Drums] are not balanced as shown on Dwgs. 1-9. It goes without saying that a substantial order of 'dynamic balance' is demanded of all of the End-Rings. As a first step, each of the Rings should be brought to 'static balance' individually. Conventional procedure for the accomplishment of 'static balance' will suffice. After each Ring has been brought to 'static balance', a satisfactory method of testing for 'dynamic balance' and adjusting according to measurements determined thereby would be to use a device as generally outlined below:-



The apparatus sketchily indicated above would operate on the relationship between (E) – the eccentricity of the attached rotor, (ω_N) – the natural frequency of the ~~loaded~~ Ring – loaded cantilever shaft assembly, (ω) – the angular velocity of the rotating assembly, and (y) – the linear displacement of the shaft due to the influence of (E). Of the above variables, (y) would be determined by the displacement gauge and (ω) by the tachometer. Since (ω_N) is an analytically-computable property of any system in which the weight of the Ring, the length, diameter, and weight of the shaft, and modulus of elasticity* of the shaft are known, it follows that an alignment chart of proper make-up would yield a value for E, the arm at which the rotor mass acts to induce the displacement of the shaft. The secondary determination at any identical shaft velocity of the displacement following from the clamping of a known weight to any randomly-chosen but accurately determined point on the rim of any Ring would then permit the determination from a second alignment chart of the radial direction of the centrifugal force due to the rotor's mass acting at the previously determined eccentricity. The same second alignment chart could be set up to yield the point at which a given balancing weight should be placed to yield a given order of balance at the test shaft velocity. A series of three, at most, such combined measurements, each followed by the appropriate attachment of balancing weights, —— with one test being performed at a low velocity, one test at an intermediate velocity, and the third at the full operating velocity of the Ring, would suffice to yield a properly balanced ring for incorporation in the Miriascope.

*tube lasticity in tension

Yet the balancing of each of the Rings to a high tolerance would not necessarily mean the obtaining of a suitably balanced overall assembly even if the method of attaching the slats and the distribution of mass amongst the slats were perfect, which admittedly is not a theoretically obtainable condition. Before the driving gear is located in its designated position, it would be necessary to test the unit for static balance. Once assured of, or corrected to, an adequate condition of 'static balance' the device in its assembled form would have to be mounted on a ~~spring supported~~ test table or floor frame, preferably a light frame (which is to say, a frame composed of light members). Using a vibrometer to measure the amplitude of the vibrations induced in the floor frame where the A-frames are tied in, it is possible to correct any assembly unbalance condition according to which of three classes of unbalance is determined to exist. These three conditions of unbalance can always be resolved to the operation of two centrifugal forces acting from the same side of the axis of rotation and in the same axial plane; or, two forces — producing a rotation couple — acting in the same axial plane but from equidistant opposed arms as referred to the axis of rotation; or, two forces — capable of being resolved into a couple and one additional force — when the two forces act in different axial planes. The addition of compensating weights to ~~produce opposing~~ the Outer Drum End-Rings to produce opposing couples and/or forces then corrects the dynamic balance of the assembly. The balancing of the Miriascope should be accomplished in two stages :- the first at Drum speed roughly ½ of the operating speed; and, the second at the full operating speed of the assembly.

...nce ... ...mbled pr... ...to A-... ...s, the ... for static ...ce would ...st be ...ugh ...ement. the rough- of this element be dis- ...rded in ... of the ...eeding ...bly ...t on the ...t Table

II. THE FITS BETWEEN CRITICAL MEMBERS OF THE ASSEMBLY :- To assist in this matter, a schedule of the required fits between various assembled members is given below :-

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 9/5/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

153. Miscellaneous papers found in Brothman's cell after his removal to Atlanta.

82

100-95068-1B

8/2

BETWEEN	&	CLASS OF FIT
Plastic Commutator Rings Holder	~~Inbore~~ Bore of Main Drive Shaft	Friction Fit
Outer Race of $1\frac{1}{8}$" shaft size bearing	Bore of its Pillow Block Housing	Snug Fit
Bore of the Inner Race of the $1\frac{1}{8}$" shaft size bearing	Main Drive Shaft	Tight Fit
Output Shaft of the Motor Drive	Bore of the Inner Race of the Outboard Bearing	Snug Fit
Hub of the Outer Drum L.H. End-Ring	Bore of the Inner Race of the $1\frac{3}{4}$" shaft size bearing	Tight Fit
Outer Race of the $1\frac{3}{4}$" shaft size ball bearing	Bore of $1\frac{3}{4}$" pillow Block Housing	Snug Fit
Main Drive Shaft	Bore of the Bearing [illegible] in the Hub [illegible] Drum [illegible] End-Ring	Medium Fit
Main Drive Shaft	[illegible] Inner [illegible] End-Ring [illegible] Hub	Wringing Fit
Stationary Shaft	Bore of the [illegible] of the $1\frac{13}{16}$" shaft size ball bearing	Force Fit (Mediu[illegible]
Outer Race of the $1\frac{13}{16}$" ball bearing in the hub of the Inner Drum R.H. End-Ring	Bore of the hub of the Inner Drum R.H. End-Ring	Tight Fit

BETWEEN	&	CLASS OF F
Stationary Shaft	Bore of the Inner Race of the $1\frac{13}{16}$" shaft size ball bearing in the hub of the Outer Drum R. H. End-Ring	Medium Force Fit
Outer Race of the $1\frac{3}{16}$" shaft size b.b. in the hub of the Outer Drum R. H. End Ring	Bore of the Hub of the Outer Drum R. H. End-Ring	Tight Fit
Member (43) Dwg. #1	Member (45) Dwg. #1	Medium Fit
Member (46) Dwg. #1	Member (45) Dwg. #1	Free Fit
Member (66) Dwg. #1	Axle Portion of Member (62) Dwg. #1	Medium Fit
Member (53) Dwg. #1	Shaft Member of the Latch-Pawl Assembly - Dwg. #1	Loose Fit

(1) Where the superscript (1) appears, attention is called to the fact that the fit should approach a wringing or tanking f

(2) Where the superscript (2) appears, the specified "snug fit" sho be a typical "snug fit".

(3) Where the superscript (3) appears, the specified "Tight Fit" sho approach a "wringing" or "tanking" fit.

(4) Where the superscript (4) appears, the specified "medium force fit" should approach a "tight fit".

* The ball bearing referred to here is in the hub of the Inner Dru R. H. End-Ring

BETWEEN	&	CLASS OF FI
Bearing Bushings	Bore of the Outer Drum L.H. End-Ring	Wringing Fit
Bearing Bushings	Bore of the Stationary Shaft	Wringing Fit
Hollow Shaft Member of Tube Support Plate	Bores of the Bearing Bushings in the Stationary Shaft	Snug Fit ①
Hollow Shaft Member of the Tube Support Assembly	Bore of the Hub of the Tube Support Bracket	Wringing Fit
Stationary Shaft	Hub of the "second support" anchor	Snug Fit ①
Bore of the Driven Gear	Main Drive Shaft	Snug Fit ②
Output Shaft of the Motor Drive	Driving Gear	Snug Fit ②

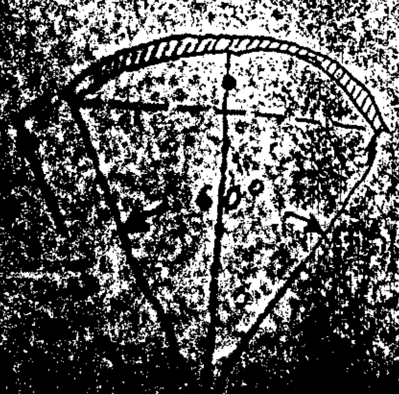
Finally, as regards the Support Members of the Inner End-Ring (R.H.) and the Outer Drum End-Ring, R.H., care sh[ould] be taken that each roller member is in solid contact o[ver] the whole rotation of these roller members with the inner surfa[ce of] the rim of the Outer Drum End-Ring R.H. And, [in fitting] the Stationary Shaft in the Split Pillow Block, the latter [should] be drawn up rigidly tight against the Stationary Shaft, [and] the capscrews fixing the two halves of the Split Pillow Block be provided with lock-washers to prevent a loosening of the [gra]
Stationary Shaft.

III. A variety of assembly and operational factors wh[illegible] will be discussed in the final section of this docu[illegible] under the collective heading of a "Syllabus of Possi[illegible] Bugs, And Their Correction".

* * * * * * * * * * *

RE-CALCULATIONS CONCERNING THE SALIENT FEATURES OF THE DESIGN

THE SLATS



The larger diameter set of slats would have a [illegible] of $24\frac{11}{16}$". The approximate area of each slat [illegible] be

$$\frac{2\pi(13)(60)(24\tfrac{11}{16})}{360} = 338 \text{ in}^2$$

and, if each slat were $\frac{1}{16}$" thick [illegible] the [illegible] of each slat would be —

$$\frac{338 \text{ in}^2}{16 \text{ in}^{-1}} = 21.1 \text{ in}^3$$

[illegible] The specific gravity of polymethacrylate sheet is 1.1 [illegible] would have a weight of

$$[illegible]\,(21.1 \text{ in.}^3) = 0.902\#$$

[illegible] velocity of [illegible]

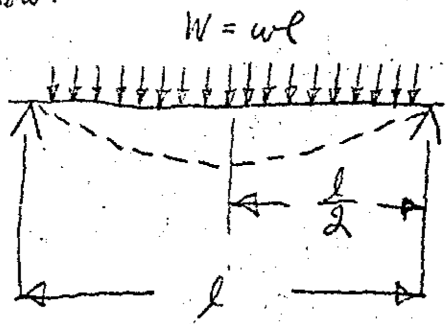
$$24\tfrac{11}{16}\left(\frac{[illegible]}{\text{rev}}\right) = 150.8 \text{ rads/sec}$$

[illegible] acting on each slat would amount to [illegible]

$$F_c = \frac{0.1902\ \#}{32\ \frac{ft.}{sec.^2}} \cdot (150.8)^2 \frac{rads.^2}{sec.^2} \left(\frac{\frac{13\ ins.}{12\ ins.}}{ft.} \right)$$

$$= 694\ \#$$

This force would be distributed as a uniform load over the entire le[ngth] of the loaded beam to give a condition as schematically ind[icated] below.



$$EI \frac{d^2y}{dx^2} = \frac{wx}{2}(l - x)$$

$$\frac{dy}{dx} = \frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3} \right.$$

Since $\frac{dy}{dx} = 0$, where $x = \frac{l}{2}$,

$$0 = \frac{w}{2EI}\left(\frac{l^3}{8} - \frac{l^3}{24} \right) + C_1$$

$$C_1 = -\frac{w}{2EI}\left(\frac{l^3}{12} \right) = -\frac{wl^3}{24EI}$$

whence :-

$$\frac{dy}{dx} = \frac{w}{2EI}\left[\frac{lx^2}{2} - \frac{x^3}{3} - \frac{l^3}{12\cancel{EI}} \right]$$

$$y = \frac{w}{2EI}\left[\frac{lx^3}{6} - \frac{x^4}{12} - \frac{l^3x}{12} \right] + C_2$$

Since $y = 0$, where $x = 0$, then $C_2 = 0$; and,

$$y = y_{max}$$

where $\frac{l}{2} = x$, so that

$$y_{max} = \frac{w}{2EI}\left[\frac{l^4}{48} - \frac{l^4}{192} - \frac{l^4}{24} \right]$$

$$= -\frac{w}{2EI}\left[\frac{5l^4}{194} \right] = -\frac{5wl^4}{384EI} =$$

$$-\frac{5Wl^3}{384EI}$$

Referring back to the diagram on Page 318, the dot on the y-
indicates the center of gravity of the slat. The distance ($\bar{y}$) of the
dot from the axis of rotation would be given by:-

$$\bar{y} = \frac{r \sin 30^\circ}{\text{rad } 30^\circ} = \frac{13(0.5)}{\frac{\pi}{6}} = \frac{13(3)}{3.14} = 1$$

The x-sectional area of the slat is approximately

$$\frac{2\pi r\, 60^\circ}{360^\circ} \cdot t = \frac{2\pi(13)1}{6(16)} = \frac{26\pi}{96} = 0.85$$

and its approximate (I_0) about its center-of-gravity is given by:-

$$0.852(13.00)^2 = I_0 + 0.852(12.42)^2$$

$$0.852(13^2 - 12.42^2) = 0.852(169-154) = 12.78 \text{ in}$$

where 13" is taken to be the radius of gyration of the slat about the
x-axis thru the axis of rotation. By the equation derived on Page 3
then

$$y_{max} = \frac{5(694)(24\tfrac{11}{16})^3}{384(26)(10^6)(12.78)} = \frac{5(694)(15)(10^3)}{384(26)(10^6)(12.78)}$$

$$= 0.000408 \text{ in.}$$

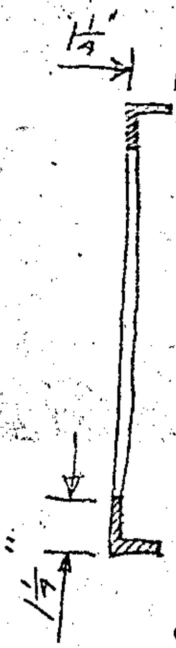
This is indeed a negligible deflection, but it ~~establishes~~ is based on
the proper value value for (E) — the (E) for steel — which is in all likelihood
large; but even if it were $\frac{1}{30}$ of the indicated value, then

$$0.000408(30) = 0.01224"$$

would be the approximate magnitude of (y_{max}). Even such a value
could be tolerated; and would evidently involve a very low
stressing of the slat. If, as per Page 3011, two sandwiching sheets
of methacrylate were to be used, then

$$\frac{360}{60}(694)(2) = 8328\#$$

would be the total load imposed on the Outer Drum End-Pl
by the slats when the Drum is rotated.



The stress induced in the End-rings would be a lo[w] stress. In fact, a 1¼" : 1¼" x ⅛" aluminum allo[y] is employed. The x-section of the angle offers an a[rea of] 0.3 in.². This would mean that, since the load is [divided] between two Rings,

$$\frac{8328\ \#}{2(0.3)\ in.^2} = 13{,}880\ \#/in.^2$$

would be the tensile stress induced. This stress lies [compar]atively beneath the elastic limit of such aluminums [as] 51S, and hence is acceptable.

CONCLUSIONS UP TO THIS POINT:-

A. The 60° slats, which are the weakest of the slats [in] the Outer Drum, will not suffer an undue [de]flection due to centrifugal loading during the running of the Drum Assembly. If this is true of slats in the Outer Drum, it certainly means that slats in the Inner Drum are equally "safe".

B. The Outer Drum Rings, which were originally specifi[ed] at 1¼" x 1¼" x $\frac{1}{16}$" 4s, but which in practice were brought to 1¼" x 1¼" x ⅛" 4s, are certainly safely [illegible]. For the Inner Drum End-Rings which are ¾" x ¾" x [illegible] 4s, and which have a cross-sectional area of ap[prox.] 0.13 in.²

$$\frac{8{,}328}{2(0.13)} = 31{,}600\ \#/in.^2$$

would be the induced stress, which is still beneath [the] elastic limit for a 51S aluminum. Consequently, [the] Inner Drum Rings are also "safe". If the modulus [of] elasticity of the 51S is taken at $3.7(10^6)$ lbs/in.²,

$$E = \frac{S}{\varepsilon} = 3.7(10^6) = \frac{31{,}600}{\varepsilon}$$

$$\varepsilon = \frac{31{,}600}{3.7(10^6)} = 0.00854$$

which is to say that

$$2\pi(13)(0.00854) = \text{peripheral stretch of the rim} = 0.696''$$

during rotation in the case of the Inner Drum
If the increase in the circumference, (Δc), is 0.696
then

$$\frac{0.696}{6.28} = 0.11''$$

would be the increment in the radius of the
the moment we were to drop the restraining influen
spokes from consideration. Continuing the check,
clear that @ a hoop stress of 13,800 #/in.^{2}

$$\frac{13,800}{31,600}(0.11) = 0.0481''$$

would be the radial stretch in the Outer Drum
Correcting the 0.696 circumferential stretch for the
of the Inner Drum Ring, which is $25\frac{1}{2}''$ instead of
find

$$\frac{25.5}{26}(0.696) = 0.684'' = \Delta c$$

and

$$\frac{0.684}{2\pi} = \Delta r = 0.1088''$$

[illegible] the Ring radius would go from $12.75''$

$$12.75 + 0.1088 = 12.8588''$$

[illegible] the case of the Inner Rings, while the Outer R
[illegible] go from $12.9375''$ to

$$12.9375 + 0.0481 = 12.9856''$$

[illegible] between the Rings of

$$12.9856 - 12.8588 = 0.1268''$$

[illegible] as opposed to the static gap
[illegible] calculations are enough to indicate
[illegible] of the radial stretch in the me
[illegible]

The stress in the Outer Rings due to their rotation is given by

$$T = \frac{w}{g} v^2$$

where:- w = the density of the ring-material (#/ft.^{3}), T = tensile stress, and, g = gravitational acceleration, ft./sec.^{2}. Where the sp. g. of [illegible] is 2.7, then

$$T = \frac{2.7(62.5)}{32} \cdot \left[(24 \text{ rps})(2\pi \text{ rads/rev})\left(\frac{13 \text{ ins}}{12 \frac{\text{in.}}{\text{ft}}}\right)\right.$$

$$= 140,000 \ \#/\text{ft.}^2$$

$$\doteq \frac{140,000 \frac{\#}{\text{ft}^2}}{144 \frac{\text{ins.}^2}{\text{ft.}^2}} = 973 \frac{\#}{\text{in.}^2}$$

Then the combined tension stress in the Outer Rings due to their [illegible] and due to the imposed load from the slats would be

$$13,880 + 973 = 14,853 \frac{\#}{\text{in.}^2}$$

[illegible] would mean a radial stretch of

$$\frac{14,853}{3.7(10^6)} \times 13 = 0.0522''$$

[illegible] which are approximately 12" in length, a [illegible] would mean a unit elongation of

$$\frac{0.0522}{12} = 0.00435$$

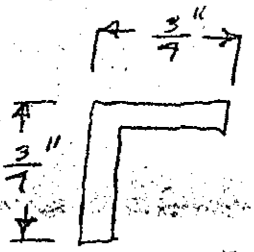
$$3.7(10^6)(\cancel{5.96}\ 4.35)(10^{-3}) = 16,080 \ \#/\text{in.}^2$$

[illegible] stretch of the spokes would take place [illegible] of this stretch, for the four [illegible] pull on the rim. Between [illegible] to the uniform loading of a [illegible] for the $\frac{1}{2}'' \times 1\frac{1}{4}'' \times$ [illegible] 0.5 in. [illegible], a stress a stress of 14,853 lbs./in.^{2} means a load of

$$14{,}853(0.3) = 4455.9 \ \#/\text{ring}$$

Per spoke, this would mean

$$\frac{4456}{4} = 1114 \ \#$$



or a stress of

$$\frac{1114}{\frac{11}{64}} = 6500 \text{ psi}$$

$\frac{5}{8} \times \frac{1}{8} = \frac{5}{64}$ in.^{2} *

$\frac{6}{8} \times \frac{1}{8} = \frac{6}{64}$ ins.^{2}

$\frac{11}{64}$ ins.^{2}

and, for a spoke length of approx. 12", the am[ount] to.

$$\frac{6500}{3.7(10^6)} \cdot 12 = 0.0211'' = \Delta l$$

For a uniformly-loaded beam with fixed ends, (y max) [de[flection] not shown here] would be given by:-

$$y_{max} = \frac{Wl^3}{384\,EI}$$

(l) may be taken to be $\frac{1}{4}$ × the circumference, whence

$$\frac{13(2\pi)}{4} = 20.4'' = l$$

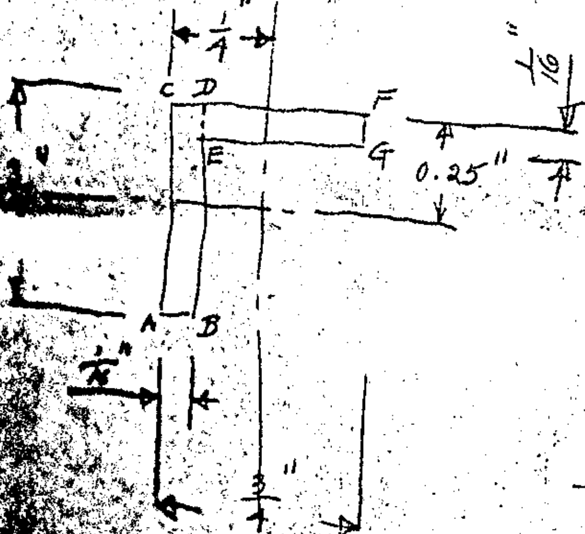
and, since I, for a $1\frac{1}{4}'' \times 1\frac{1}{4}'' \times \frac{1}{8}''$ ∠ is 0.04 in.^{4}, then

$$y_{max} = \frac{1114(20.4)^3}{384(3.7)(10^6)(0.04)} = \cancel{0.467}\ 0.2335''$$

This indicates that a doubling of the number of spokes already specified would be required to hold the between-spokes deflection of the rim to tolerable limits. Such a doubling of the no. of spokes used would halve the load per span, and halve the span —— the combined effect of which would be to cut the between-spokes deflection to $\frac{1}{16}$ of the value computed above:- or

$$\frac{\cancel{0.467}\ 0.2335}{16} = \cancel{0.0292}\ 0.0146''$$

In the case of the Inner Kinge, only part of the solution to the prob
of preventing a large between-spokes deflection lies in doubling
no. of spokes, for the moment of inertia of the angle section is a



The moment of inertia of $\overline{ABCD}$ abo
own neutral fibre would be :-

$$\frac{1}{12}\cdot\frac{1}{16}\cdot\left(\frac{3}{4}\right)^3 = \frac{0.42}{192} = 0.$$

About the indicated X-axis the moment of inertia of this section
be

$$I_x = 0.00219 + \frac{1}{16}\cdot\frac{3}{4}\cdot\left(\frac{1}{8}\right)^2$$

$$= 0.00219 + \overset{0.00073}{\cancel{0.00586}}$$

$$= \overset{0.00292}{\cancel{0.00805}} \text{ in.}^4$$

moment of inertia of $\overline{EDFG}$ about its neutral fibre wou

$$\frac{1}{12}\cdot\frac{3}{4}\cdot\left(\frac{1}{16}\right)^3 = \frac{3}{48(4100)} = 0.0000153 \text{ in.}^4$$

dicated X-axis would be approximately

$$I_x = 0.0000153 + \frac{3}{4}\cdot\frac{1}{16}\cdot\left(\frac{1}{4}\right)^2$$

$$= 0.0000153 + 0.00293$$

$$= 0.00295 \text{ in.}^4$$

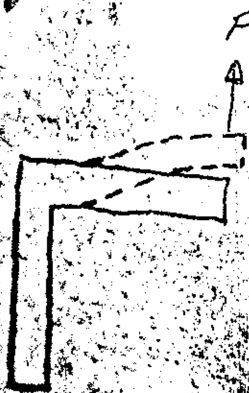
(I_x) of approximately 0.00587 in.^{4}

inertia of the angle section would i
flexure. Roughly it would am

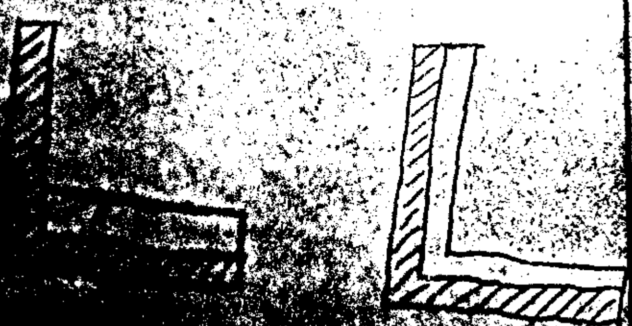
(0.03) = 1.555"

$$\frac{X\,1.555}{16} = 0.091''$$

for an 8-spoke wheel. Before pressing the "8-spoke fo
to a conclusion, and before proposing a solution for the exc
"between-spokes" flexure of the Inner Drum End-Rings, it
pay to give attention to the problem which arises because of t
the loading of the centrifugal force acting on the slats to on
of the 7 rims. A situation such as is indicated below



In other words, a tendency would exist
loaded leg to flare out due to a conc
of the loading. This would be most noticea
the case of the Outer-Drum L.H. End-Ring
then, in the next instance, in the case of
Outer Drum R.H. End-Ring. It would
applicable to the Inner Drum End-Rings.
the load involved is such that if it con
over any single portion of a $1\frac{1}{4}'' \times 1\frac{1}{4}'' \times$
will produce an excessive deformation of the concentrated-
[illegible] tension stresses are concerned, there is but
[illegible] and that is to increase the area of me
[illegible] Here is indicated some of the ways in which th
[illegible] accomplished:-

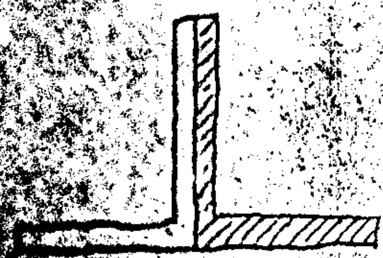


(6)

* * * * * * * *

(In each case, the x-hatched mem[illegible] [illegible]
is the presently-specified Z-[illegible]m)

* * * * * * * *

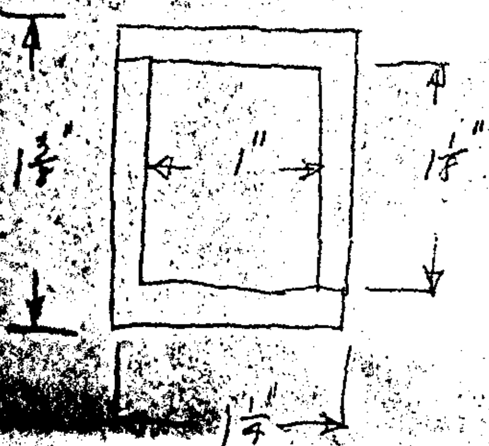


(D)

From purely structural considerations, (A) [illegible]
(D) provide the soundest mean[illegible] of "beefin[illegible]
up" the stressed section. From [illegible] cost
[illegible] and (C), and particularly (B), stand better.
[illegible] (B) and (C) involve the greatest re-design of the latc[illegible]
[illegible] — in that for the given stroke of the Positioners'
[illegible], any increase in the metal thickness of the leg thru w[illegible]
[illegible] plungers go means a decrease in the displacement
[illegible] the latch-pawl can be pushed. Though it would
[illegible] that this is true for (A) as well, certain accom[illegible]
[illegible] made with (A) which are not so easily
[illegible] others.

[illegible] towards a final solution of the problems
[illegible] ourselves on (A), and for the momen[illegible]
[illegible] the plate consisting of a sandwic[illegible]
[illegible]. A section as per
[illegible] area of 0.6". The (I) for this sec[illegible]

would be :-



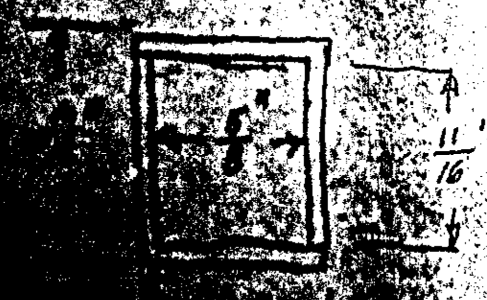
$$I = \frac{1.25(1.375)^3 - 1(1\frac{1}{8})^3}{12} =$$

$$= \frac{3.25 - 1.42}{12} = 0.1525 \text{ in}$$

Accordingly, the deflection of 0.0146" on Page 324 would now assume a [illegible] of

$$\frac{0.0146(0.04)}{0.1525} = 0.00363"$$

The (I) value for a similarly treated Inner Drum End Ring wou[illegible]



$$I = \frac{\frac{3}{4}(\frac{13}{16})^3 - \frac{5}{8}(\frac{11}{16})^3}{12}$$

$$= \frac{\frac{3}{4}(0.532) - \frac{5}{8}(0.323)}{12}$$

$$= \frac{0.399 - 0.202}{12} = 0.0164 \text{ in}$$

and, similar to the case of the Outer Drum E[illegible] [illegible] of 0.091" given on Page 326 [illegible]

$$\frac{0.091(0.006)}{0.0164} = 0.0333"$$

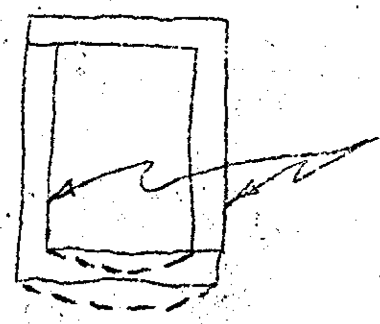
[illegible] ring is 4455.9 #/ring.

[illegible]

$$y_{max} = \frac{54.5\left(\frac{5}{8}\right)^3(12)}{192(3.7)(10^6)\left(\frac{1}{16}\right)^3} =$$

$$\frac{54.5(0.243)(12)}{192(3.7)(10^6)(2.43)(10^{-6})} = 0.000\,922''$$

be the probable order of the deflection of the loaded side of the bo[x] for the case of the box formed by the two $\frac{3}{4}'' \times \frac{3}{4}'' \times \frac{1}{16}''$ ∠s, the beam formed by the bottom is held to have an $(h) = \frac{1}{16}''$, a (b and the so-formed beam is held to be one having its ends fixed. were the order of the flexure due to the slats in motion, or even if it several multiples of the indicated value, then the danger of a condi[tion] such as is indicated below:-



A SEVERE DEFLECTION OF BOTTOM PANEL OF THE BOX MEAN A DRAWING IN OF SIDE(S) TO WHICH THE ARR[OW] POINTS

developing until a collapsing of the beam occurs is indeed ser[ious].

Thus, it is possible to sum up the major aspects of this section by stating that the structural stability of the Drum a[s] under dynamic conditions demands that:-

1) the $1\frac{1}{4}'' \times 1\frac{1}{4}'' \times \frac{1}{8}''$ ∠ rims be converted from an angle section of the indicated dime[nsions] to a box-section with an $h = 1\frac{3}{8}''$ and a $b = 1\frac{1}{4}''$ by properly joining two ∠s of the indi[cated] specifications

2) the $\frac{3}{4}'' \times \frac{3}{4}'' \times \frac{1}{16}''$ ∠ rims be converted from an angle section of the indicated dimensions, t[o a] box-section with an $h = \frac{13}{16}''$ and a $b = \frac{3}{4}''$ by properly joining two ∠s of the indicated specif[ications]

and,

3) each End-Ring should be converted from a 4-spo[ke]
ring to an 8-spoke ring

Having thus assured ourselves of the structural correctness a[nd]
stability of the Drum Assembly as such, we may now pass to a
consideration of the associated mechanisms.

Firstly, let us obtain an approximation of the weights o[f]
the two Outer Drum End-Rings and the two Inner Drum End-
Rings:-

A steel ∠ $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{1}{8}"$ would weigh 1.01 #/ft. The [density]
of iron is 7.87, and that of aluminum 2.7. This means, on [the]
basis of a 13" O.R. box-section, a weight of

$$\frac{2(1.01)\,2\pi\,(13)(2.7)}{7.87\,(12)} = \frac{566}{12} = 4.71\#$$

for each of the Outer Drum End-Rings. The x-sectional area o[f]
a $\frac{3}{4}" \times \frac{3}{4}" \times \frac{1}{16}"$ ∠ is (Page 321) 0.13 in.^{2} as compared [to]
a 0.3 in.^{2} for a $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{1}{8}"$ ∠. Thus, the box section
formed as per above from the $\frac{3}{4}" \times \frac{3}{4}" \times \frac{1}{16}"$ ∠s would weigh
approximately

$$\frac{0.13}{0.3}(4.71) = 2.04\#$$

for each of the Inner Drum Rings. This would give a total of
wt. of

$$2(4.71) + 2(2.04) = 9.42 + 4.08 = 13.5\#$$

for the end-ring assemblies. To include the mechanisms which a[re]
hung onto the various End-Rings, it would be a fair estimate [to]
add on another 2.5#, raising the total weight to 16#.

Basing ourselves on a sandwich formation for the slats [of]
2 sheets of $\frac{1}{16}"$ thk. polymethacrylate sheet holding between them

the filter sheet), it is clear by Page 318 that if one 60° s.. weighs 0.902# for one 1/16" thk. sheet, then the weight of methacrylate on each Drum would be of the order of

$$\frac{0.902(360)(2)}{60} = 10.824\#$$

giving a total of 21.648# for both Drums. Approximating the weight of the Rings and the Slats to act from a 13" radius, then

$$\left[\frac{31.55+16}{32}\right]\left(\frac{13}{12}\right)^2 = \Sigma m r_x^2 = 1.382 \ \#\text{-sec}$$

Consider all of the spokes to be 13" lg., and fabricated from 3/4" ∡. There are 8 spokes per wheel, and 4 wheels to take into ... This means

$$\frac{32(13)}{12} = 34.6'$$

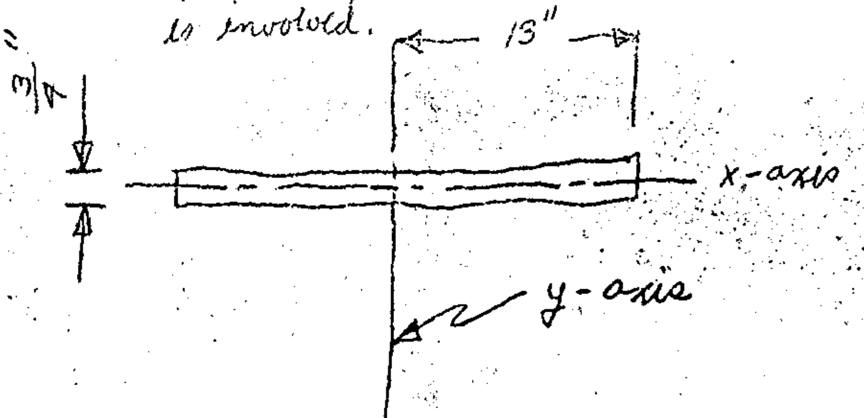
of $\frac{3}{4}" \times \frac{3}{4}" \times \frac{1}{8}"$ ∡ involved. If as per Page 321, a $\frac{3}{4}" \times \frac{3}{4}"$ ... $\frac{3}{4}" \times \frac{3}{4}$ angle has a x-sectional area of 0.13 in.^{2}, then a ... ∡ would have approximately 0.26 in.^{2} of x-sectional area which would mean

$$\frac{34.6(0.26)}{144} = 0.0625 \text{ ft.}^3$$ of aluminum

is involved. This would mean a weight of

$$0.0625(62.5)(2.7) = 10.55\#$$

is involved.



Consider this 10.55# weight to be concent... to a single bar 2... lg. and 3/4" wide, about the origin of indicated set of coor...

The $(m r^2)$ about the x-axis would be

$$\frac{10.55}{32(12)} \cdot \left(\frac{\frac{3}{4}}{12}\right)^2 = \frac{10.55}{32(12)} \cdot 3.9(10^{-4}) =$$

$$1.08 \times 10^{-5} \text{ lbs.-ft.-secs.}$$

The $(m r^2)$ about the y-axis would be:-

$$\frac{10.55}{32(12)} \cdot \left(\frac{26}{12}\right)^2 = \frac{10.55(4.7)}{32(12)} =$$

$$1.29(10^{-1}) \text{ lbs.-ft.-secs.}^2$$

Since

$$I_p = I_x + I_y$$
$$= 1.08 \times 10^{-5} + 1.29(10^{-1})$$
$$\doteq 1.29(10^{-1}) \text{ lbs.-ft.-sec.}^2$$

Thus, the Drum Assembly would have a total inertia of

$$1.382 + 1.29(10^{-1}) = 1.511 \text{ lb.-ft.-}$$

Then, the energy that must be assigned to the Drum in getting it up to a speed of 150.8 rads./sec. would be

$$\frac{1}{2} \cdot 1.511(150.8)^2 = \frac{1.511(22700)}{2} = 17,200$$

which, if done in 60 secs., would amount to:-

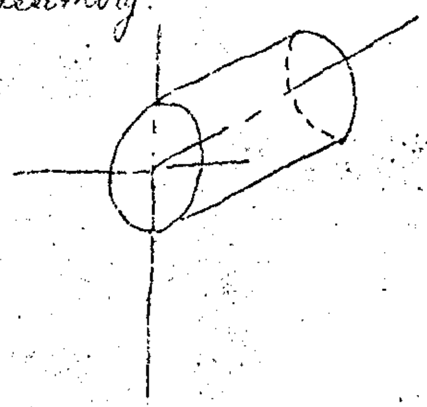
$$\frac{17,200}{60} = 284.4 \text{ ft-lbs./sec.}$$

Start-up in 60 secs. would then demand a

$$\frac{284.4}{550} = 0.518 \text{ HP motor driver}$$

This size of motor demanded here for start-up alone raises the question of a reconsideration of the sandwich formation of the slats to reduce the weight involved.

But before we consider a change in the design of the slats, we enter into the question of the power demand of the against the air fluid that fills the cabinet. The princi power load is due to the centrifugal fan action of the Dr assembly.



The fan action would occur pri at the end-faces of the rotor, wi cylindrical portion of the Drum a comparatively small contribu fan action. By a derivation indicated here, the fan eque of the end-faces would vary as the 5th power of the of the rotor, while the influence rotor length would be as the 0 of Drum length

By the writer's understanding, a 22" diameter rotor, 1/16 called for a $\frac{1}{20}$ HP motor driver. Then,

$$0.05\left[\frac{26}{22}\right]^5\left(\frac{24}{\frac{1}{16}}\right)^{0.3} = 0.05(2.31)(384)$$

$$= 0.05(2.31)(5.95) = 0.688 \text{ HP}$$

would be the size of unit required to power the instant d if we assume that the $\frac{1}{20}$ HP motor was 75% loaded, then

$$0.75(0.688) = 0.516 \text{ HP}$$

would be the actual power-demand here. It would then s a $\frac{3}{4}$ HP motor would be required.

Next, the question of braking the mechanism arises. If of the Drum Assembly is 1.591 lb.-ft-secs. and the D to be brought to rest in about 60 secs, a negative accele

$$\frac{150.8(2)}{60} = 5 \text{ rads./sec.}^2$$

is needed, and this would require an applied torque of

$$1.511(5) = 7.555 \text{ ft-lbs.}$$

Basing ourselves on the Eddy Current Brake already described, the designed Brake at its feed of 25 milliamps would exert a torque of

$$0.1772(25)(1) = 4.44 \text{ ft.-lbs}$$

at the peak velocity of the Drum; and, at $(\frac{1}{25})$ of the [illegible] running velocity of the Drum would exert

$$0.1772(1) = 0.1772 \text{ ft.-lbs.}$$

Thus between an angular velocity of 150.8 rads./sec. and

$$\frac{150.8}{25} = 6.03 \text{ rads./sec.}$$

the designed Eddy Current Brake would exert an average torque of

$$\frac{4.44 + 0.1772}{2} = 2.31 \text{ ft-lbs}$$

which means that

$$\frac{2.31}{1.511} = 1.528 \text{ rads./sec.}^2 = \text{the yielded}$$

negative acceleration, and

$$\frac{150.8 - 6.03}{1.528} = 94.4 \text{ secs.}$$

of braking-time would be required to go from 150.8 rads./sec. [illegible] 6 radians/sec. Thus, a slight re-design of the Eddy Current Br[illegible] to provide for a higher permissible current feed-rate might bring the speed-control Brake at its over-excited condition into effective use as the Brake for slowing down the drum in switching to black-and-white viewing.

One important question in viewing the braking problem towards attaining a speed suitable for Plunger "A" to go home is the question of how much energy the plunger-member of Position "A" can absorb.

$$Y_{max} = \frac{WL^3}{3EI}$$

deflexes (y_{max}) for a cantilever beam, which is what the plunger [Item # 45, DWG. #1] is:-

$$y_{max} = \frac{Wl^3}{3EI} = \frac{(Wl)\,l^2}{3EI} = \frac{Ml^2}{3EI} = \frac{\frac{SI}{c}\,l^2}{3EI}$$

$$= \frac{Sl^2}{3Ec} = y_{max} = \frac{2Sl^2}{3Ed}$$

Since $l = 1.5''$, if we specify a limiting stress of 20,000 psi,

$$y_{max} = \frac{2(20{,}000)(1.5)^2}{3(26)(10^6)(\frac{5}{16})}$$

$$= \frac{2(20{,}000)(2.25)(16)}{3(26)(10^6)\,5} = 0.0037''$$

and now by

$$y_{max} = \frac{Wl^3}{3EI}$$

$$0.0037 = \frac{W(1.5)^3}{3(26)(10^6)\frac{\pi}{64}(\frac{5}{16})^4}$$

$$\frac{0.0037(3)(26)(10^6)(\pi)(0.0095)}{3.37} = W = 2560\#$$

which is to say that since the stored elastic energy would be given

$$E_E = W\frac{y}{2}$$

then

$$2560(0.0037) = 9.46 \text{ in-lbs.}$$

would be the energy which safely be stored in the plunger-mech Positioner "A". Thus, the maximum speed from which the pos could act would be

$$\frac{9.46}{12} = \frac{1.511\,\omega^2}{2}$$

$$\left[\frac{2(9.46)}{12(1.511)}\right]^{1/2} = \omega = 1.04 \text{ rad/sec}$$

Actually, the above calculation, despite its optimistic reflections on [illegible] problem, yields a deceptive result. The force between the drill-hole [illegible] Heat "A" and the plunger of Positioner "A" which would be invo[lved] is impractical. We will return to a consideration of this p[roblem].

If we assume the use of a $\frac{3}{4}$ HP motor and assume t[hat] under early indexing conditions, it will give 25%, on the average, [of] its full-load output torque, then

$$\frac{0.75(63025)}{1725} = 27.4 \text{ in.-lbs.}$$

or

$$\frac{27.4}{12} = 2.28 \text{ ft.-lbs}$$

would be applied to the acceleration of the drum. Then

$$\frac{2.28}{1.511} = 1.508 \text{ rads./sec.}^2$$

would be the initial acceleration. To travel one full revolution [would] then require, starting from rest,

$$2\pi = \frac{1}{2}(1.508)t^2$$

$$\left[\frac{4\pi}{1.508}\right]^{1/2} = t = 2.88 \text{ secs.}$$

at which time the Drum Assembly would be moving with a v[elocity] [illegible] of

$$\frac{1}{2}(2.88)(1.508) = 2.17 \text{ rads./sec.}$$

[illegible] velocity as indicated above at which Positione[r] [illegible] done. At this rate, it will clearly be seen that whe[n the] Drum itself is driven by the Drive motor in re-align[ment] [illegible] the load imposed on the latch-pawl in locking w[ould be] [illegible]. This calls for a re-evaluation of the [illegible] to be used operating Positioner "A" and in

<u>THE MIRIASCOPE</u>

2 A.M.
5/27/51

Regarding:-

1. The synchronization system:- Conditions now make it look as if I will have to leave the detailing of the scheme outlined in "Drive Motor Arrangements" to you. I believe that the ideas were outlined with a sufficient clarity to enable a competent servo-engineer to proceed with this. The calculations in "Drive Motor Arrangem... in view of the comments re motor size below hold only as an outline. All indications are that the same magnetic structures that operate the mechanism can be temporarily over-excited when braking for the black-and-white realignment of the Drums. This would eliminate the brute solution which the solenoid-operated brake provides. The calculations on Pages 316 thru 336 indicate that a "shorting out" of the tube which normally feeds the magnetic structures in synchronization control, and a substitution of a source capable of feeding possibly 50 milliamps would provide braking in a reasonable time (estimated 1 minute).

(torque control)

2. The Drive Motor:- The calculations on Pages 316 thru 336 indicate that the motor-size was sharply underestimated in the original calculations, and that a motor of 3/4 HP size is required. The binding factor here is the "fan load" on the motor, rather than start-up energy. In computing the "fan load", the basic relationships I have used are correct (such as the influence of rotor diameter and cylinder length on the power required), but the estimate that a 1/20 HP motor is 75% loaded with a 22" slice of 1/2" thickness is just an estimate. Therefore the

In Page (E.E.) Section marked IMPORTANT

Therefore the size of the Drive Motor should be checked against the more precise information you must have. Quite possibly a substantially smaller motor would suffice.

3. The gearing — the recent change in the gearing that drive the Main Drive Shaft was in accomodation to the newly-conceived synchronization method. This will be seen from Page 6 of "Drive Motor Arrangements" and based on a 1725 rpm full-load motor speed. It is assumed that constant speed service for the motor would be established around the 1725 rpm full-load speed. The [illegible] here in this matter are left up to you. One thing important must be lived up to here in connection with the gearing and that is the use of an Oil Reservoir or Oil Bath for right-angle transmission. Helical gearing is to be used. In general, in all right angle gear transmissions, a great deal of rubbing action between the gear teeth is involved, and the proposed partially-filled Oil Bath (with one gear working thru the oil layer) provides for the long-life of the gears involved.

4. The functioning of Positioner "A" and realignment operation. The calculations on Pages 318 thru 336 indicate that bring Positioner "A" into action at speeds more than just a few rpm would be to impose such loads on the [illegible] or plunger portion of the Positioner as would wear the pin and the rim of the drill-hole of [illegible] [illegible] leading to a considerable friction between these [illegible]. Moreover it would seem that the use of [illegible] [illegible] proper driving the Inner [illegible] [illegible] up to speeds in realignment operation [illegible] shock loads on the latter [illegible] [illegible] involved. Therefore, my suggestion

(CC

would be to :- a) bring the Drum Assembly to rest by
positioning the Drum Assembly as a whole thru Positioner
and, (b) in starting the Drum Assembly again preparatory to
operating Positioner "A", to start the motor thru a high
resistance that would reduce the applied voltage to the motor
a very low level — a level such that the motor would
or weakly move the Drum. The same practice as regard
the application of less than full voltage to the motor would
to all realignment operations in which the Inner Drum is mo
by itself. Some changes in the Control Circuit would be neces
by this scheme, and taking these in combination with the n
of using a temporarily over-excited Eddy Current Brake
the Stacking unit in ~~black and white~~ going to black an
white alignment from color operation, would produce the
following suggestions :-

2) Using a cheap version of the Ellinco D.C. Generator tachometer it would be possible to get a "[illegible]" signal from the Drum Assembly, the signal being in the form of the absence of a blocking signal to a tube operating a plate circuit relay. Such an arrangement would eliminate the Tachometer Relay C3. The deenergizing of the plate circuit relay could relay a signal from the black-and-white position of the selector switch C2 to the timing relay now controlling the application of the motor phase signal to the motor via C9; also, by another set of contacts [illegible] circuit relay power supply from the black-and-white position of C2 to a conventional relay [illegible] shorting out of the tube normally feeding the [illegible] way of the auxiliary power source for [illegible] brake could be eliminated. Thus the start of the Motor Drive from "rest" to the positioning [illegible] "A" would begin immediately after the Drum Assembly had been brought to rest and the brake had been de-energized.

the operating coil of

Positioner "A" should be activated as per the recent Control Circuit by the same signal that energizes the operating coil of C8.

and;

b) The feeding of the power signal to the motor from the indicated contacts in C9, C10, and C12 would in each of these cases pass thru the same resistance units to control the applied voltage and output torque from the Drive Motor; while in the case of C11 [illegible] phase supply for the regular color [illegible] operation of the motor would be applied directly to the motor to give a full voltage energizing of the motor.

As a whole, the functional pattern of the Control Circuit changes only in that Positioner "A" is [illegible] after the Drum Assembly has been brought to rest.

c) The formation of the plate:- Page 310 comments on the fabrication of the plate, and suggests a sandwich [illegible] with two sheets of polymethacrylate [illegible] an [illegible] layer supporting a filter film [illegible] can be obtained from a single sheet [illegible] gelatin can be applied [illegible] the standpoint of many considerations [illegible] any method of obtaining adequate filter action by the use [illegible] a single methacrylate sheet for each slat should be used. But regardless of the slat formation method used,

I M P O R T A N T

1. the polymethacrylate slat dimensions should be kept as now indicated. [illegible]

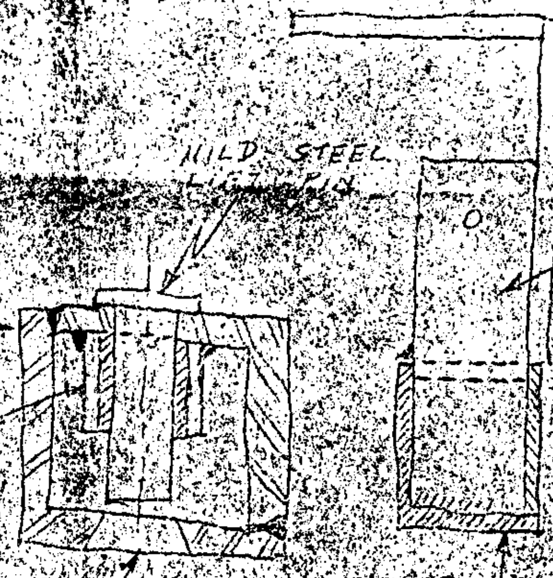
2. The number of filter areas within each slat sho[uld] be doubled to give what fundamentally amoun[ts] to a 12-color (4 sets of three) rather than a 6-color (2 sets of three) which

I M P O R T A N T

to enable a halving of the Drum Speed as per a previous suggestion from you. The use of clear methacrylate sheets as the base of the slat structure makes such a move possible since the filter sections are merely applied media to a [illegible] clear sheet. Since the fan and power required by the Drum would vary as the cube of the Drum speed, a cutting of the power requirement to one-eighth of the presently computed level would be made possible as regards the running power requirements of the drum assembly. The start-up energy requirements for the same starting-time would be cut to one-fourth of the present requirement. Thus, it would be possible to use a $\frac{1}{4}$ HP Drive Motor.

6. The End-Rings — A [illegible] of the calculations Pages 318 to 326 is that the outer Drum End-Rings should be modified with a complementary [illegible] of the same dimension as the presently specified [illegible] to form a box-section [illegible] with a base of $1\frac{1}{4}$ and a height of $1\frac{1}{8}$, [illegible] the [illegible] should be similarly modified to [illegible] a base of $\frac{5}{4}$" and height [illegible] a conclusion that [illegible] from their present [illegible]

to [illegible] & - spoke construction



The modifications which the box construction involves in the mounting of the latch pawl, grab, and support members mechanisms are typified above. A lift pin communicates between the pin or plunger member of the Positioner [illegible] [illegible] communicate the pin stroke to the latch pawl. The same lift pin construction appears in connection with [illegible]
The [illegible] are now mounted on the top panel of the [illegible] of the inner surface of the X [illegible]. The [illegible] which support the latch pawl are extended [illegible] [illegible] box section, and are weld[illegible] [illegible] On the other side of the Drum [illegible] along the axle of [illegible] [illegible] the top [illegible]

[illegible] members "A" and "B" [illegible]
[illegible] of the solenoids of [illegible]
[illegible] storing energy in (a) the recoil spring [illegible]
[illegible] latch pawl mechanism, and (b) the [illegible] recoil
spring by which [illegible] and "B" return to their
normal position. A distribution of the lift-force [illegible]
solenoid such that 80% of the lift force acts to compress
the [illegible] recoil springs, and 10% acts to [illegible]
energy in the latch-pawl flat spring, while 10% [illegible]
balanced would be adequate. In the case of the P [illegible] member
of [illegible] a spring is incorporated in the P [illegible] to hold
the ball bearing against the [illegible] end of the follower. At
75% of the solenoid's lift-force, this spring should yield
just enough for the ball to move clear of the [illegible]
the pin [illegible] and roll in the [illegible] socket [illegible]
the ball up.

[illegible] the framework [illegible] most important to the proper [illegible]
the unit in general is the tying together of the [illegible]
into a stable and [illegible] (and rigid) structure. [illegible]
not been touched on in the calculations. It is left [illegible]
you. If necessary, the 4 members comprising the framework
can be [illegible] so that members now specified [illegible]
become 1 [illegible] $\frac{1}{8}$) while those specified [illegible]
become $1\frac{1}{4}$" x $1\frac{1}{4}$" x $\frac{1}{4}$" [illegible]. The foot-pads [illegible]
to horizontal [illegible] beams in the cabinet, and the framework
will receive a certain amount of rigidity from the [illegible]

of the box section. The essential geometric relationships are in each case kept unaltered from those shown on [illegible]. Naturally, the support members will now ride [illegible] the [illegible] of the Outer Drum R & End Ring. In constructing the End Ring, the spoke to rim plane to be maintained for the most part is now indicated on Dwg 1-8. In instances where the maintaining of the box [illegible] a taking down of a portion of one leg of a spoke X, the [illegible] the basic construction as per Dwg. 1-8 are to be set up [illegible] the appropriate support panels for the support members, lateral panels, etc. set in place on the originally shown X, and the [illegible] complementary X's (suitably notched for the support panels) are to be welded on to complete the intended box sections. The welds [illegible] the two X's to one another to form the box angle need not be in the form of continuous welds except as such would contribute towards easier balancing of the final Rings. Though the box section modification was computed at the higher velocity of [illegible] rpm and is in fact less critical modification at [illegible] rpm, one would do well to maintain it at the lower drive speed. The 8-spoke construction is mandatory at both speeds. For emphasis it is repeated that all mechanisms previously mounted on the top sides of the formerly specified X rims are now to be mounted on or above or work with the top faces of the new [illegible] sections. The same [illegible] geometric relationships [illegible] and requirements are to be maintained.

[illegible] springs – springs now appear as component[illegible] [illegible] "A" and "B"), and the latter [illegible] [illegible] the placement of the [illegible] [illegible] brake elements, a [illegible] the Brake Assembly on Dwg [illegible]

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 2/20/52

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent J. M. Collins

Source from which obtained See Serial 768

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retained

List of contents:

154. Photostatic copy of the letter written by Brothman to the Reverend B.B. Nielsen, 4th Avenue, and 46th Street, Brooklyn, N.Y. whom Brothman classified as a friend.

(83)
100-95068-1B

SEARCHED ____ INDEXED ____
SERIALIZED ____ FILED ____
FEB 28 1952
FBI - NEW YORK

NUMBER 71647	Letter sent to Following Address:
NAME ABRAHAM BROTHMAN	NAME REV. B. E. NIELSEN
If written for one inmate by another enter name and number of the actual writer in space below:	Street and Number [illegible] AVE. & [illegible] ST.
WRITTEN BY	City BROOKLYN, State [illegible]
NUMBER	Relationship FRIEND
Inmate's name and number must be signed at the bottom of this letter and correspond with that on this coupon.	DO NOT WRITE BELOW THIS LINE
NOTE: Do not write on reverse side of this coupon.	Last Letter to Same Address
	Total Number to Same Address

FPI—LK—11-2-50—1,100M—7605

THURS. EVENING
JAN. 17, 1952 (Date)

From ABRAHAM BROTHMAN
PMB 71647, ATLANTA, GA.

To REV. B. E. NIELSEN (Name)

[illegible] AVE. & [illegible] ST.
BROOKLYN, 18, NEW YORK (Address)

Dear Bjorn,

I have your letters of Dec. 25 and Jan. 1, and as always these letters have brought the warmth, the loving kindness, and in general the wonderful spirit that I have [illegible] with you. And nothing comes more welcome here than these good and human qualities! [I say 'good and human' and not just 'good' alone, because anything less than these qualities is [illegible] less than 'human', something more [illegible] to be associated with the lower species.]

I'm reminded of what the word 'human' has always meant to me whenever in the [illegible] as happened tonight, a sheet of paper entitled "Notice of Action of Parole Board" chances to co[illegible] The ostensible message, as you might surmise, is a single word:- "Denied", but, as is so oft[en] the [illegible] what the high and the mighty would dismiss with a single word, it never quite gets [illegible] that easily. For every contemporaneous verdict, it must be borne in mind, there will also be [illegible] and later decision, and that later decision belongs to history; and I'm confident that histor[y] will be with me.

But it nevertheless never fails, when I look at that peremptory "Denied", to evoke a whole train [illegible] for it is no light matter to be told that your freedom is "Denied". I cherish freedom, but, as [illegible] and mighty found out a little more than a year ago, I place it cheaper than my obligat[illegible] history. My written application to the Parole Board and what I had to say in my personal appearance [illegible] Parole Judge made this clear, for as accurately as I can recall both my written and [illegible] I stated that [illegible] for the earliest termination of a manifest injustice". And then I went on to say that the on[ly] [illegible] able motive for the alleged crime had to be a guilty association with espionage, and nothing [illegible] be more ludicrous than such an accusation for neither the Brothman that people knew in pe[rson] [illegible] the one they knew thru his writings could conceivably have been a trafficker in "secrets". [illegible] contrary, I insisted, mine had been a record of a ruthless opposition to the penetration of [illegible] magic and wizardry into science; and, moreover, I argued, I had always felt that the o[illegible] the scientist to make his work publicly known stands as a higher calling than any other pur[illegible] think of, having none. No person requited by such a point, and I offered more than [illegible] reprints of published articles to substantiate my claim to this viewpoint, could possibly have in[illegible] in "cloak and dagger" escapades to pilfer "secrets", nor could he have become the accomplice [illegible] who found in such endeavors a satisfaction which outweighed their judgment or [illegible]

So "Denied" is the verdict on my request to [illegible] at the earliest possible [illegible] the [illegible]lication of my [illegible]! "Denied" is the verdict on my openly-announced intention [illegible] saving"! "Denied" is the verdict on my contention that my return to society is at least [illegible] with the best interests of society as they found the applications of Japanese and German war crimina[illegible] be! And "Denied" is the verdict on my children's oft-repeated request that their [illegible] home!

Those who have announced themselves as the champions of democracy and [illegible] of crocodile tears for the supposed transgressions of others against the rights of individ[illegible] written the verdict; and I [illegible] this [illegible]. [illegible] understand this, this "[illegible] in the [illegible] even [illegible] disturbing to me than it is [illegible] to "Denied" which [illegible] negligible part for second by [illegible] of theirs. And moreover, [illegible] "[illegible] which they have handed me is their certificate of eligibility to the ranks of history's [illegible] oppressors, the ones which [illegible] the verdict of those [illegible] to its [illegible] — to the [illegible] freedom and science!

I know that their "Denied" will [illegible] my badge of identification [illegible] American liberalism, for it is [illegible] that the [illegible] with [illegible] the feeling [illegible] the [illegible] [illegible] [illegible] freedom in which [illegible]!

The day when I will again be able to sit down with [illegible] discussions [illegible] "Denied" [illegible] the that day [illegible] I look forward to [illegible]!

[illegible]

[illegible]

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 3/10/52

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent J. M. Collins

Source from which obained See Serial 769

Address

Purpose for which acquired - Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit retain

List of contents:

155. Photostatic copy of a letter to Abraham Brothman from his wife Naomi.

156. Photostatic copy of a letter to Naomi Brothman from her husband Abraham Brothman.

(84)

100-95068-1B

SEARCHED ...... INDEXED ......
SERIALIZED ...... FILED ......
MAR 29 1952
FBI - NEW YORK

To: Abraham Brothman #71647 Feb. 13th
From: Naomi Brothman, 41-08-42 St. LIC Wednesday

Dear Abe:

Have had no letters from you this week but ~~what~~ with the Holiday yesterday and the general delay this is not surprising at all. Will probably get one tomorrow.

Saw yesterday the play I wrote you before. Was greatly impressed by it this time, even more than before. I have completely forgotten what it was all about but found it even more timely now than before. I wonder if you remember it though I am sure that you do. You have such a good memory. They have changed the play somewha[t] but the punch is the same. By the way the part of the inquisitive boy, played formerly by our neighber, is now played by a girl. I gue[ss] it was easier to get a girl than a boy to do this small but good part.

It has gotten very cold here again and it looks like I have caught something of a cold. In fact as soon as I finish this letter I will go home, not because I feel bad but merely as a precau[tion]. I guess I swallowed too much cold air last night and as a result I am somewhat hoarse. However, it is nothing to worry about.

Otherwise there is very little to write about. Children are doing pretty well and behaving also pretty well. Anita still comes out with pretty funny remarks. When I reprimanded her for some[thing] or other she retorted "Well I did not turn out so well" or something to that effect. I do not know how this sounds now but it was pretty funny at the time she said that. She is a very comical character in general.

With further feference to my conversation with Joe, while this matter has not been fully settled, it is on the way and will be handled again through Goldie, as formerly.

It also seems that the Pumpkin man has written another installment of his memoirs for a big magazine. I have not read it as I would not spend a dime or whatever it is for same. You probabl[y] saw it and I understand it is quite the thing. He practically refute[s] the theories of science, etc. Quite a guy he turned out to be. I guess he wants to be immortal and ismaking sure that his opinions are recorded. Besides of course, the fee of something like 75 thous[and] dollars helps along. He even appeared on the radio and television.

Please excuse me for not writing more — am going home — so again with Best Regards and love from the family. As ever

Naomi

Naomi Brothman

didn't qualify for the institution of higher learning, and he had to content himself with ad-
mission to an establishment of less rigorous entrance standards, — a disappointment which
sure he keenly feels! [My competence to speak for him, I'm sure you will understand, ari
course from that kinship between us that derives from the fact that both of us had to grad
from Ivy League schools to eventually make this circuit. If indeed my residence in the halle
halls of Columbia University taught me to forever seek the highest realms of attainment in every
deavour, I'm sure that his tenancy at Harvard, where to be sure there's a bit more of that
ing verdant species of vegetation than at Columbia, must have similarly implanted in him a comparable se
standards governing his ego-expression.]

And since one thing leads to another, I see by the newspapers that that certain incarcer
gent is now seeking a new trial on the basis of some new evidence. Silly boy! By this time,
have learnt that facts have nothing to do with the facts"! Like Drool Pearson, I too "predict" tha
will come to nothing, for the good Federal Judge who is slated to hear this thing is prob
brighter gent than the character on whose behalf the petition was filed and because of this fac
dismiss the whole thing. I'm sure that this sagacious jurist, who in the first place found it in
with his standards of court-entertained and court-entertainable veracity to listen the Pump
out, will also find that a few additional departures from the truth by that latter spec
really of small consequence; and in this judgement, I too would frankly join him, for what's
about a few extra lies when the Pumpkin Man's whole story was palpably one long orgasm of
and auditory hallucinations.

I'm afraid that the Harvard alumnus will have to complete the course for which he is en
rolled; and it may be that it will do him some good, though this latest action doesn't sp
highly for his scholarly aptitude. He's going to have to learn to view the world in less static te
by less congealed standards. In his day and mine at school, we were taught that fiction
confined to literature and the right to tamper with even normal word-usage required a "po
license". Well that doesn't hold anymore! In this more highly-refined culture of ours, in this
all possible civilizations, we've widened the frontiers where fiction is permitted, and when it'
in court its teller, if he's on the right side, is equipped with a new kind of legal privileg
a "prevaricator's license"; and indeed it's a sorry sort of liar who doesn't make use of this new

As ever,
Abe

Abraham Brothman, 71647

From ABRAHAM BROTHMAN
PMB 71647, ATLANTA, GA.
To MRS. NAOMI BROTHMAN (Name)

THURS. EVENING
JAN. 31, 1952 (Date)
41-08 42 ST.
LONG ISLAND CITY 4, NEW (Address)

Dear Naomi,

Since my last writing, I've received your letters of Thurs.-Jan. 24 and Mon.-Jan. 28. In letter of Jan. 28, there came a receipt-slip for your $20 money-order. I thank you from the my heart for this contribution to a "worthy cause"; as for underlined advice, to holler for when the need arises, please be assured that I am afflicted with few if any inhibitions in the of soliciting financial assistance, and on that account you would be well-advised to be of a cessation of such solicitations. In fact, this inclination of mine to earnestly, persistently consistently request monetary aid, believe me, is one which stands in the least need of coaxing, for it, in common with my other stronger leanings, rests firmly on the on the deepest and of my intellectual convictions.

But to be serious again, Monday's letter thrilled me! I'm very happy that you enjoyed the As I've already written, you know that I enjoyed it too. And if I haven't said this before, proud of the way you conducted yourself. I'd like to say more about the visit but I'm still too ecstatic about it to be coherent; and so, until I calm down, let me set it down it still makes me feel good all over just to recollect it.

It's too bad that the weather was so poor while you were here. Though I'm not a the Georgia Chamber of Commerce, I wouldn't be doing right by my present status as a " permit you to go away thinking that Sunday's and Monday's weather is the usual thing it isn't; and there's little doubt in my mind but that it was some Yankee weather either drifted down here by accident, or was directed here by some subversive plotter your impression of this land of sunshine and a few lesser marks of distinction. I'm sure certain Senator had been here, that he'd join me in the latter notion and probably some account for the whole thing. But what am I laughing at! I'd probably rank high on the names, unless there's a State Dept. official or two around. About the latter possibility, know, for truth to tell even if there were they wouldn't reside here with me unless the had worked them over as one former State Dept. official was. And even in that one case, that

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 3/18/52

ABRAHAM BROTHMAN

100-95068-1 B

(Title of case)

Submitted by Special Agent J.P. Collins

Source from which obained See Serial 770

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

157. Photostatic copy of letter dated 1/11/52 to Abraham Brothman from Naomi Brothman.

158. Photostatic copy of letter dated 1/5/52 to Mrs. Naomi Brothman from Abraham Brothman.

(85)

100-95068-1B

SEARCHED ___ INDEXED ___
SERIALIZED ___ FILED ___
APR 2 9 1952
FBI - NEW YORK

[illegible] your letter of January 3rd. I have read it [illegible] and am very pleased that the work you have been doing is [illegible] and productive. While most of it is not very comprehe[illegible] I can see its implications and future uses.

As far as my trip is concerned, I am somewhat at a loss to figure it out at the present time. As I have written you, I will have [illegible] travel by train - it seems that air travel now is out of question - wea[illegible] conditions are bad and then I have no right to worry mother. This mean[illegible] a long trip by train, which will certainly not stop me. But how to spe[illegible] two days in Atlanta and then another day in Washington I do not know. I was planning to take two days off - Monday and Tuesday, but this will [illegible] permit me to spend two days in Atlanta. Of course, I will write for permission to the Warden but before doing this I intend to get a train schedule from Penn Station tomorrow and try and figure the connections. [illegible] am not too anxious to spend any moretime in Atlanta than necessary and [illegible] do not particularly feel like sight-seeing, with all due respect to Atl[illegible] If I could see you over the week-end twice, it would work out all right but I do not think that this will be allowed. At any rate I will have to work it out myself and will of course inform you accordingly in my next letter. Please, if it is at all possible, send out the material a[illegible] soon as you can, so that if I get to Washington on Tuesday of next week [illegible] January 22nd, Mr. Bennett should have it in his possession. [illegible] will write to him for an appointment, of course.

I have been told over the phone, that there is a letter from you today addressed to Elsa. I am very pleased with that and much relieved too. While I do not wish to influence you in any way, it is very important to my way of thinking to write to the children as often as possible. I have heard a few remarks from Elsa to the effect that she has written you twice but has received no reply. It is very hard to impress a child that you cannot write as often as you want to, [illegible] Elsa being quite a spirited or stubborn child cannot be convinced of many things and I prefer to leave her alone, if I can at all help it. I find that too much pressure usually results in contrary results. [illegible] write them as often as you can and always write a few lines to Anita.

I haven't spoken to Mr. Nielsen for a long time but Mr. [illegible] evidently met him somewhere and they had a nice chat together. He mentioned that he has been getting nice letters from you. It is very hard for me to call Mr. Nielsen because I never can find him in his office. On the other hand I do not like to call him at his apartment because his wife is quit[illegible]

I expect to see Goldie over the week-end and will convey to him all your recent remarks, etc. He does not get to New York too often and I will make it a point to see him this time. After all when he does come in to New York there are so many affairs of the [illegible] that he has to attend to that his time is limited. I will write to you fully very soon and let you know of my plans, the best that I will be able to make. I will try to arrange for next week end but do not be disappointed if it will have to be the following one. You know the plans of mice and men [illegible] etc. So again with best regards [illegible] from the family, [illegible]

As ever,

NUMBER 71647

NAME ABRAHAM BROTHMAN

If written for one inmate by another enter name and number of the actual writer in space below:

WRITTEN BY

NUMBER

Inmate's name and number must be signed at the bottom of this letter and correspond with that on this coupon.

NOTE: Do not write on reverse side of this coupon.

Letter Sent to Following Address

NAME MRS. NAOMI BROTHMAN

Street and Number 41-08 [illegible]

City LONG ISLAND CITY State [illegible]

Relationship WIFE

DO NOT WRITE BELOW THIS LINE

Last Letter to Same Address

Total Number to Same Address

FPI-LK-11-2-50-1,100M

From ABRAHAM BROTHMAN — SUNDAY EVENING

PMB 71647, ATLANTA, GA. — [illegible], 1953 (Date)

To MRS. NAOMI BROTHMAN (Name) — 41-08 [illegible] ST. LONG ISLAND CITY, N.Y. (Address)

Dear Naomi,

Yesterevening I received your letter of Wed. Dec. 2, and I trust that ~~even as I write this~~ Anita has already recovered from her battle with the "bugs". I'm confident that this is already so; somehow Anita to me has always epitomized the quintessence of healthy, happy living; and it's [illegible] for me to conceive of any "bug" that could be evil enough to want to hurt her too much. It seems to [illegible] Anita's innate charm is so great that for her to tame a most ill-intentioned "bug" into a [illegible]ity would be no stupendous task, but rather a routine matter. It's just a shame that [illegible] had such a rough anti-climax; and it hurts to think of anything that would take the happy [illegible] her face even for a moment. By way of some compensating moments for her uncomfortable struggle with [illegible] tell her that everybody here who's seen her photos — and that means just about 2000 people — has [fallen] in love with her. One of the quaintest things said of her was a remark by a country-boy who [illegible] that "she's got plenty of 'tickuns' in her eyes". [A 'tickun' is most likely a contraction of "[illegible]" and probably connotes a coquettish quality.]

With this blend of a fervent prayer that all is now well with Libby and my confidence that you've [every]thing under control, I turn to a request you made of me some time ago, namely that you'd like for [me to] comment on some of the ~~[illegible]~~ more interesting items appearing in the newspapers we both read. Just such an item of interest appeared in the "Times" of Wed. Dec. 30, and it concerned the experimental conversion of the heat energy of [a "bree]der" nuclear reactor to electricity. The quality which made this article so appropriate for comment by me [was neither] the noteworthiness of this achievement nor the fact that I predicted it to you some years ago, but rather [its value] as a demonstration of the art of "secretese".

A "breeder" reactor is a flamboyant name for the type of U-238-to-Plutonium-239 [illegible] [desig]ned for a maximum neutron economy efficiency. As you may remember from my previous explanations of a [re]action, it's the action where neutrons [illegible] from a controlled detonation of U-235 [illegible] [to] convert the non-fissionable U-238 to the man-made and fissionable element Plutonium-239. [illegible] [illegible] to prompt the desirability of such a conversion — (a) the fact that the naturally-found fissionable [U-235 is] present in very small concentrations (about 0.7% by weight) in normal uranium ores, which ores are at

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 6/12/52

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent J. M. Collins

Source from which obained See Serial 774

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

159. Photostatic copies of letters received by subject, Brothman, at the U.S. Penitentiary, Atlanta, Georgia.

(86)

100-95068-1B

SEARCHED ____ INDEXED ____
SERIALIZED ____ FILED ____
JUN 24 1952
FBI - NEW YORK

[illegible]

[illegible] yesterday I received your [illegible] from you [illegible] to the children — this in addition to the [illegible] Nov. [illegible] three letters for last week. The [illegible] very good. Of course, I will read it first to Elsa and then [illegible] to Anita, depending on how she will take this. Elsa [illegible] this week as she is already planning a letter to you.

Your letter of Nov. 8th is fine and very appropo [illegible] recall I also mentioned this anniversary to you together [illegible] Life is just a succession of strugles one after another and [illegible] to do is to live and look forward to a better life.

This being "Open School Week" I visited Elsa's [illegible] night and found out that she is quite pleased with Elsa [illegible] is a lot of improvement in her work now and that she is [illegible] accept school and maybe even like it. [illegible] morning I [illegible] class and was very pleased with her behavior there. She [illegible] shines among other children. Of course, I am prejudiced [illegible] it. I do not particularly care for her teacher but Anita [illegible] with everybody. She is beginning to read and is making [illegible] advances in school.

I spoke yesterday to Clare — and she [illegible] you. She is preparing for me two sets of your articles [illegible] send as directed by you. She told me, among other things [illegible] who is down South, visited his sister who is very [illegible] and is kept very busy.

I have not heard from [illegible] for [illegible] is kept busy and does not come to New York too often [illegible] call him and find out whether there is any news there. [illegible] other hand, you promised me to write something about your [illegible] and I have not received it as yet. Of course, it may [illegible] in one of the letters that you have written since. [illegible] if you can.

Again there is very little that I can write [illegible] to the above. Life, I assure you is very monotonous here [illegible] there is nothing that I can complain of — absolutely [illegible] still there is so little of interest that I can write [illegible] these letters [illegible] to assure you, however, that I appreciate your letters and the spirit in them very much. Of course, I did not expect anything else but still it is very reassuring [illegible] it. Many people feel that way too and [illegible] sometimes which is very natural, still there are many [illegible] look forward [illegible]

[illegible] your health is good and that you [illegible]

[illegible]

Abraham Brathman
PMB 21547, Atlanta, Ga.

from Ch. Bjorn B. ...
Washington Cath...
4530 ... Ald.
April 21, '53.

Dear Abe,

I am not, this time, trying to explain how sorry [illegible] for not writing you before. I shall only say that [illegible] been going in circles with my next move and many incidents and appointments. I shall talk more [illegible] when we meet in New York.

It seems almost certain that I will be accepting [illegible] appointment at Bellevue Hospital. This is, to me, the [illegible] difficult and challenging position of those I have [illegible] turning over in my mind. However, it is only for a [illegible] of one year. Then, I will have to look for some[illegible] [illegible], again. My family has also expressed their desire [illegible] stay in New York, on the condition that we are able [illegible] find an apartment near the hospital. My daughter [illegible] [illegible] emphatically that she wants to see me as often [illegible] possible as well as much as possible. So as soon as [illegible] find a place to live, I will resign from my [illegible] position. Dr. Howard Rusk has already expressed [illegible] delight in having me on the staff. He seems to be [illegible] of a personality I want to work with, because [illegible] an intensive desire to help his patients and he [illegible] a healthy interpretation of the chaplains work.

[illegible] making this decision you also came into the [illegible] [illegible]. I am fully aware of the fact that I have not [illegible] as much help to you and your family as [illegible] I could be while you have been away. Now

[illegible] relationship has developed into a mutual f-
ship. I am looking forward to the day when we can
[illegible] walks here in New York as you at the pre-
time enjoy with your friends in the prison yard. Wri-
[illegible] more about those experiences. I have met [illegible]
you so long and it has always been under some me-
and emotional strain. In spite of this I have alwa-
felt you have a genuine warmth for people, and
your last letter I felt your deep concern for yo-
fellow men as you relate with them behind the
walls. For this reason [illegible] wish to see more of you [illegible]
future. I don't wish to sound like a sentimental fo-
there are so few people in this circle of my acquaintanc-
[illegible] have deep understanding and feeling for
[illegible] you write, "I'd be able to see you frequent-
[illegible] for you", it is a strong motive f-
[illegible] you any idea when you can expec-
[illegible] think your wife said
[illegible]

I must also add that my stay in New York will give m-
opportunity to continue with the doctor for another yea-
[illegible] Evelyn [illegible] baked the first cake f-
[illegible] herself. She made the only cake I did not like,
[illegible] it was good and ate it. She is a great comfor-
me. She sends her greetings to you. She does my
[illegible] day.

I hope you are able to keep up the good spirit
[illegible] in your letters to both me and your
family. My heartiest greetings with best wishes

Chaplain Bjarne B. Nielsen [illegible]
Norwegian Lutheran Hospital
4520 4 ave Brooklyn 20, N.Y.

To: Abraham [illegible]
From: Naomi [illegible], [illegible]

Friday
May 9th

Dear Abe:

Received your letter [illegible] Thursday and was very pleased to have answers to my questions even before my letter reached you. I am very glad that you are getting along in sports and otherwise. I was also glad to see that you have been making resolutions about acquired habits and that you intend to continue xixx to live with them in the future. These are very encouraging news as you know how strongly I feel about these things and how much I have talked and about them in the past.

I was also pleased with the promises you made to Anita and and also hope that you intend to honor them in the future. I have wanted to write and to talk to you about these things before but unfortunately, when I saw you, we never had any time. I have alway wanted to bring it up but somehow never did do it. As you have now plenty of time to think things over, you must recall a lot of situa and many conversations that we have had in the past about personal matters, which I believe, I was on the right track and not you. You must realize that you can rationalize and verbalize much better tha I and, while you never convinced me that I was wrong, things went o the way you were shaping them. Of course I realize the cause of all but still in all certain situations will have to be changed and elim Unfortunately we cannot go into this in our letters and I do hope th we will have time to discuss it next time when I see you. But in th meantime I do hope you will give it consideration as I am sure that you are well aware of what I mean. You remember the song you used to sing about "resolutions on paper". Well another dictum of yours was always about theory and practice. So I do hope that all your theoretical resolutions will have practical applications and that yo are making plans along these directions. I do not want to go into this any further and have only written the above because you gave me an opening about your habits and about your intentions to live with the better ones in the future.

I saw Mr. Nielsen yesterday and have conveyed to him what we have discussed. I think that for the present it would be best th he writes first. Then this can be followed up by a visit, if necess What do you think about it. He will write you directly.

I spoke to Clare yesterday too. She has received a letter from you and has written you this week in reply. I am arranging to see her in the very near future that I am able - so that will take care of your request.

I know that there is a letter at home from you - probably of last Sunday - I will answer same during the week-end - probably tomorrow, I hope. Otherwise, there is nothing new to write - the children are all right and busy. Otherwise there is nothing new to write about. I am still, as always, attending to everything th is to do and wil keep you posted about any new development.

So again with Best Regards and love from the Family, I a

As ever

FD-
(7-17-52)

BULKY EXHIBIT - INVENTORY OF PROPERTY ACQUIRED AS EVIDENCE

Bufi

New York Field Division

Various Date

Titl and Character of Case:

ABRAHAM BROTHMAN
100-95068-1B

Date Property Acquired: See below

Sour From Which Property Acquired: See below

Loca on of Property or Bulky Exhibit: In Vault

Reas for Retention of Property and Effo s Made to Dispose of Same: Evidence & Information

Desc ption of Property or Exhibit and Iden ty of Agent Submitting Same: See below

160. ne photostat of letter from Subject to Chaplain E.B. NIELSEN, 8703 3rd Ave., rooklyn 9, NY dated 7/10/52. - See serial 780

87

100-95068-1B

SEARCHED .... INDEXED ....
SERIALIZED .... FILED ....
SEP 30 1952
FBI - NEW YO

Fie File #:

THURS. EVENING

From ABRAHAM BROTHMAN — JULY 19, 1952 (Date)

PMB. 71047, ATLANTA, GA. — 8703 – 3 AVE

To CHAPLAIN B. B. NIELSEN (Name) — BROOKLYN, 9, NEW YORK (Address)

Dear Bjorn,

It's my guess that by the time that this letter arrives, Evelyn [illegible] sota. I hope that she'll have just the kind of a summer vacation that she's [illegible] so very important that a child enjoy her vacation, her [illegible] and [illegible].

I'm mindful as I think of Evelyn Louise off on her vacation of the two summer vacation[illegible] country that I had as a child. I thrill to the recollection of these events today even [illegible] they stand today in a different framework of experience than they did then. What was a matter of [illegible] restness then is a matter of humor today; and what only vaguely touched me then stands [illegible] ent relief today.

From the soot-laden air and the nondescript greyness of a New York ghetto to the fr[illegible] and the rich greenness of the countryside was a bigger trip than the four hours that the [illegible] told of. Only a journey thru celestial space could encompass such a change; and so our p[illegible] for the voyage were certainly no less in scope or magnitude than those Peary had made for [illegible] the Pole. All things were taken into a account:- the possibility of a monstrous change in [illegible] a first-aid kit to deal with bloody emergencies; and of course an ample supply of sandwiche[illegible] a thermos-jug of coffee. This [illegible] ; a [illegible] 'supply dep[illegible]' [illegible] dimensions accompanied us in the baggage-car of the train. This latter 'supply dump', packed [illegible] dozen borrowed travelling-grips and an ancient trunk that happened to belong to us, took eve[illegible] to account; everything that the imagination could conjure up. And the imagination of a ghett[illegible] people in a big city knows no limit!

A thousand years of adventure were crowded into approximately five hours.- a ferry-boa[illegible] to a distant land known as Weehawken, New Jersey; and then an honest-to-goodness [illegible] a locomotive-powered train belonging to the ostentatiously-named New York, Weston, and [illegible] Our destination? A frontier-land in the Catskills, Ellenville by name. Even as I write of [illegible] seems to me that I can still feel the sweep of the wind against my face as I stood on the [illegible] point on the ferry-boat's deck. A month of anticipation of this journey and the [illegible]

f excitement that accompanied the approach of D-Day turned the hot New York August i
n Arctic blast. In my vivid imagination, I steered this mighty ocean-prowling luxury
to its home-port at Weehawken with bold twists in this and then in that direction of
n that ten-minute ride from West 42 St. to Weehawken, all of the rides I had previousl
n the top-deck of a double-decker Fifth Avenue Buses in their totality were dwarfed
tinginess. Nor was a boat-ride on the main Central Park lake to be compared to this o
on the vast expanses of the Hudson River! The ghetto knew a boundary, I had learned a
and that horizon lay at West 42 St. in Manhattan.

In the years since this event took place, a mighty torrent of hours and pages have be
in an almost never-ceasing endeavor to place the concept of the 'infinite' within an ultim
finition; but even today I've nothing but a few devices-of-mathematical convenience by which to
this momentuous projection. But what has for good and sufficient reason escaped my (and e
else's) intellect as a hard and fast physical concept has been known to me on an intuitiv
ever since the day I boarded the country-bound train at Weehawken. An eternity, an inf
time, is still the length of time it took for that train to get started. I can't remember much
happened from then on until we arrived at Ellenville because a cruel fate, to my everlas
grin, caused me to fall asleep on the train; and, tired by the accumulated nervous strains
slumbered almost all of the trip. But Ellenville will always stand for me as my first rendez
with extravagance, for it was at Ellenville Station that we sent a telegram to my Father ass
that we had safely and soundly survived the rigours of our ghetto-shattering journey. The Br
— Mother, daughter, and son —, carefully worded a message to be whipped across the long li
up until that moment had — so far as we knew — served only the whims of the maharajahs of h
finance.

I was destined in the years to come to roam some goodly portion of the skies of the two hemispheres, and - in some
almost all of the ghetto's chains have since been broken; but the day on which I first slipped
the ghetto's fortress walls still lives on with a freshness I guess it will never lose.

A 'bon voyage' to Evelyn Louise, even though a belated one, and my very best wishes
you and Mrs. Nielsen for the happiest kind of a summer! I hope that these reminiscences
bored you. In an indirect way, they'll at least convey why I've always hated poverty and p
residence, a ghetto.

Abraham Brottman, 71647 Yours-in-friendship,
Abe