

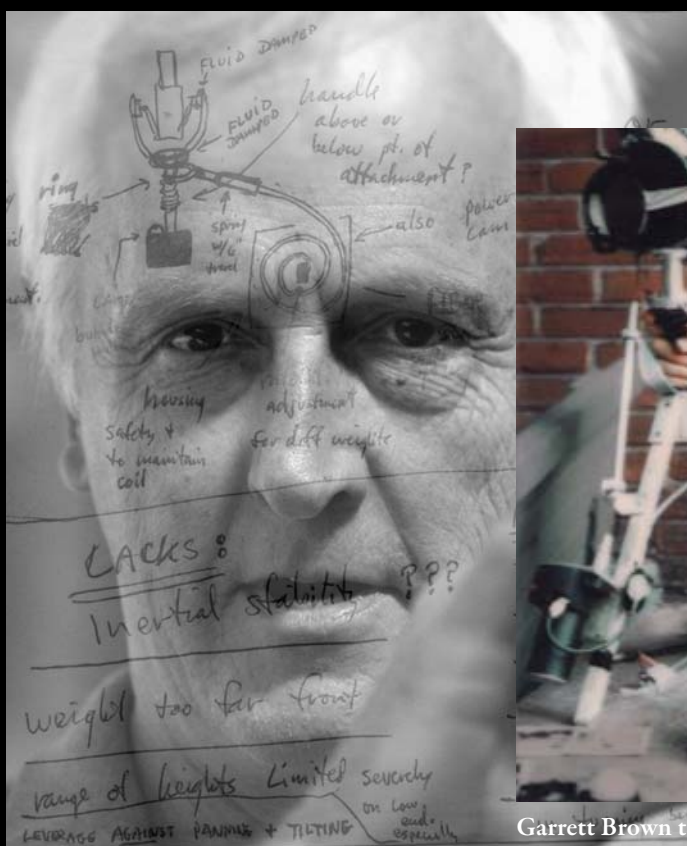
STEADICAM

Inventing the Steadicam®

Part 2: Last Chance Motel

by Garrett Brown © 2006

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Garrett Brown today, with some of the lists and diagrams he made while inventing the Steadicam®; with his first fiber optic viewer.

CAMERA OPERATOR is pleased to present the next installment in Garrett Brown's gripping tale of the invention of the Steadicam. In the last episode, Brown concluded: "It was maddening and faintly sickening to contemplate; I had just showed the Hollywood movers and shakers that the impossible could be done, that human beings could walk and run and climb stairs and deliver sensationally smooth shots..." but he was paralyzed by the "undisclosed deficiencies of the CineTurkey, its weight and size and clumsiness. Despite the lightness of the Éclair, every shot in the demo had been accomplished in a stew of sweat and weariness..."



PROMISING LINES

REF AGAINST SWINGING WEIGHT

Liquid cabled

1. BOOM STRAIGHT DOWN FROM CAMERA (TRY BOOM AT ANGLE) (suspension point nearest to CAM - just below gun head) ^{2nd} suspension means MUST come from straight behind (spring at hip)

BUT:

a. WEIGHT FARTHER FORWARD THAN WITH BOOM running straight back

b. HITS GROUND IN LOW SHOTS

2. DISPLACE MAGAZINE TO REAR? (NG)

3. HANDLE VERTICAL

4. HANDLE SWIVELS IN CERTAIN DIRECTIONS?

5. USE OF MORE THAN ONE PERSON (NG)

WITHHOLD MILITARY RIGHTS

FIBER OPTICS SIGHTS

CAMERA IN free space

Damped motion

vertical reference

FIBER GLASS SPRING

FLAT STOCK

COILS GIVE IT THE RANGE

CALL DR SIGMUND

MR KENYON

FALLING DOWN DAMAGE

FOAM PROTECTION?

SPACE DESIGN?

ADD CHIN STRAP

peripheral vision left eye

VIEWF

OR HARKING SWAY RIGHT ON

Shock absor

Electron

LASER?

Hydraulic

RADAR

PARALLELOGRAM

GYROS?

VS

VS TRACE VERTICAL?

SPECS REQUIREMENTS

1. REMOTE REFLEX

2. EQUILIBRIUM SUSPENSION

3. WEIGHT ON SHOULDERS + HIPS (minimum extra weight)

4. CONVENIENT (foot away from body)

5. RANGE OF LENS HEIGHTS

6. PAN TILT FOCUS ZOOM

7. COMFORT CARRY ALL DAY (GOOD BALANCE)

8. QUIET

9. FOOLPROOF

10. MINIMUM STICKING OUT SPACE

11. BEST USE OF HANDS

LOOK UP COMPOSITE MATERIALS in Sci AMERICAN

Fiber Composite ISOLATED (VERT + HORIZONTAL + ANGULAR)

ORIGINAL PRINCIPLE: STABILITY OF POLE

TEST 4835 WA-3-4466 Ed Allen Don MacCortley

Boom and/or

Useable in system

Suspended anywhere

Gives "reach" to cam

FRONT TO BACK?

SIDE TO SIDE?

UP + DOWN?

See # 17 1-hand displaced

OTHER

REF PAN + TILT TO HEAD?

motorized pan + TILT

GYROS ALSO ISOLATED (removal from camera helps balance?)

noise blimped + tuned out

FLAOT WITH HUMAN SERVO-MECHANISM DAMPING

Garrett: "No idea was too outlandish. I have notes and sketches that are still goofily seductive. One then- unnoticed list was dead-on..."

In early December, I checked into the West Chester Holiday Inn for a desperate seven-day marathon of thinking.

From Taw's Art-Supply I brought along pens and notebooks and protractors and rulers and bezier-curved templates and a drawing compass and giant pads of white paper. I brought sheaves of earlier sketches and notes and experiments and lists of desirable features and schemes to achieve them. I disabled the television set. I read no books and saw no newspapers. Day after day in my silent back-corridor room, I launched my disordered attention into the void—sometimes hyperactively: pacing and scribbling and wolping room-service meals and bending over my old drawings again and again—sometimes somnambulistically: eyes closed, arms outstretched for long minutes in imaginary shooting postures, senses

a spin in the darting firelight of my imagination. A low-grade inferno, tamped down and smoldering at night but never quite extinguished; flickering here and there in dry Newtonian dreams, flaring up each morning as I smoked in bed and drank room-service coffee, burning fiercely as I ate breakfast in the corner of the restaurant, hands darting over pens and rulers and piles of drawings like Georges Melies' quizzical professors in *A Trip to the Moon*.

The room service guys and the maids all learned not to move bent coat hanger models or disturb anything whatsoever, and crumpled papers and even used towels in the bathroom stayed where they were dropped. I explained what I was after to the black housekeeper, a dignified woman, who said that guests often hid themselves away and behaved oddly but that I was the most memorable (and least threatening) of the

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hyper-alert to the faintest ergonomic hint that might brush past in the dark.

It was the most vivid week of my life: a headlong, careening virtual sleigh ride with no external symptoms of momentum or velocity, no wind in the hair, no baying of wolves in pursuit; just the onrushing dread of nothingness, the cold fear that my bloated gizmo would fail to 'revolutionize cinematography' because of some trivial oversight, and I would end up like those poor bastards in the Gizmo aviation videos, still smiling and making delusional claims as their fragile contraptions destroy themselves and fling parts around their heads. Of course if the airplane had proved to be impossible they would have found peaceful oblivion; but imagine the torment of the doomed 'flapping discs' man and the 'butt-mounted rocket' guy and the absurdly talkative 'winged woman' when they finally got to see the Wright brothers' simple, clean, sensible Flyer!

For most of that week oblivion seemed preferable. If Brown shall not Effect his Level Camera Holder, then shall no one else!

The whoosh of distant toilets and showers edged into wakeful immobility for an hour or so at dawn with only the twitch of an eyelid to suggest the frenzy of the search—for the shape, the feel of anything devised since the Industrial Revolution that might enable my own little revolution and weigh less than a damned locomotive. Over and over I assembled the virtual pieces and brandished whatever thing resulted and gave it

bunch. This tale has been told and retold in interviews and has something of a gloss but it's true—I borrowed cleaning appliances and convulsed the maids, charging up and down the hall with brooms and mops and vacuum cleaners balanced on my fingers to somehow feel how 'it' might feel and my frenzy transcended all embarrassment. What actually happens at a flat-out run? How far do knees and elbows and shoulders protrude in front or stray to the side? How closely can 'it' be carried without obstruction? What elements, in what form, could be small enough to 'handle' the weight and size of a 35mm camera in such close proximity?

No idea was too outlandish. I have notes and sketches on Holiday Inn notepaper that are still goofily seductive:

"Try twin curved rails that arch over your shoulders on inverted roller-skate epaulettes.

"Try balance beams that stick out behind and are bungeed down to your shoes.

"Try connecting pan and tilt to your head.

"Try flexing parallelograms.

"Try using more than one person. (I never got around to testing this brilliant notion until the 'Master's Workshop' of 1988.)

"Try air bubbles floating in egg-shaped containers of oil." (Wha?)

"Try leveling servos, hydraulic pistons, radar referencing, etc. etc. (How did I miss cold-fusion?)

One then-unnoticed list was dead-on. It called for: "Remote

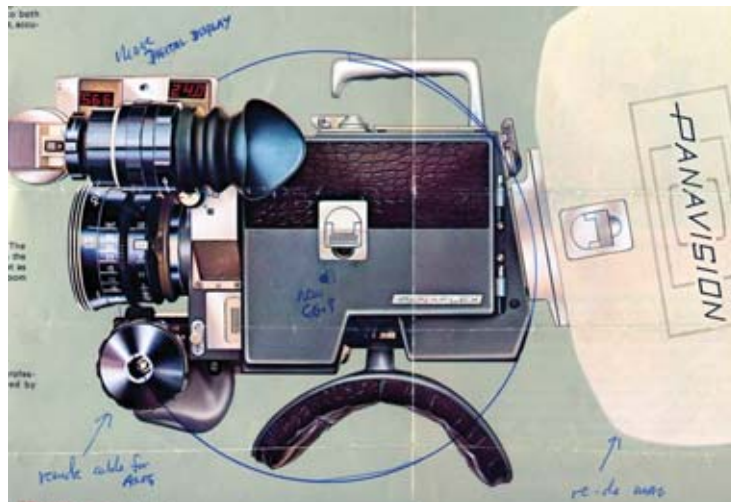
reflex viewing; Isolated suspension (from vertical, horizontal and angular motions); Minimum extra weight; Close operation to the body; Ability to 'float' with 'human servo-mechanical damping'; 300 degree pan, 100 degree tilt, zoom to 150mm; Lens height: knees to above head (waist to head, minimum)"—a stunningly prescient description of the ultimate device!

I had dreams about Gottschalk's Panaflex and traced its profile from his brochure onto sketches that illustrated every way it might possibly be shoehorned onto the crane. The Eclair weighed ten pounds. The Panaflex weighed twenty-seven, with lens, magazine and film, and was enormous! The CineTurkey would have to grow even longer and all chrome, fins and whitewalls must go! To help balance it I drew versions that sent the film crawling six feet through flexible tubing to a magazine mounted at the rear of the crane; but considering the camera assistant's perpetual struggle with light-leaks and dust, those long conduits were absurd. One brilliantly compact version, over which I exulted for an entire, tired, stale evening, turned out to have no magazine at all! (No Problem!)

The viewfinding dilemma gave me heartburn all week. On Thursday, I called Dr Sigmund at American Optical who chuckled mysteriously and announced that the solution was simplicity itself! A 'reduction-bundle' already existed! A tapered inch-long 'boule' of drawn glass fibers (\$1000) could handily reduce the 35mm image to 16mm! I could use the 16mm bundle I already owned and if the mating surfaces contacted each other though a skim of oil the image would come through bright and clear! I ordered a tapered boule to be 'drawn' immediately.

In the end, running around with that silly push-broom held upright and picturing the crane as a vertical object led me to "it"—the Golden Fleece, the Grail, the Wright Bloody Flyer of movie gizmos. Two of my unappreciated earlier sketches had shown cameras mounted on top of simple, rigid structures with batteries spread out down below as counterweights. Of course I was used to carrying around the Queen Mary and doubted they would be inert enough to be stable, but the key to lightening my big clumsy ship actually lay before me in both of those drawings (and future one-pound camcorders would likewise move smoothly aboard hand-held, 12 ounce "Steadicam Merlins").

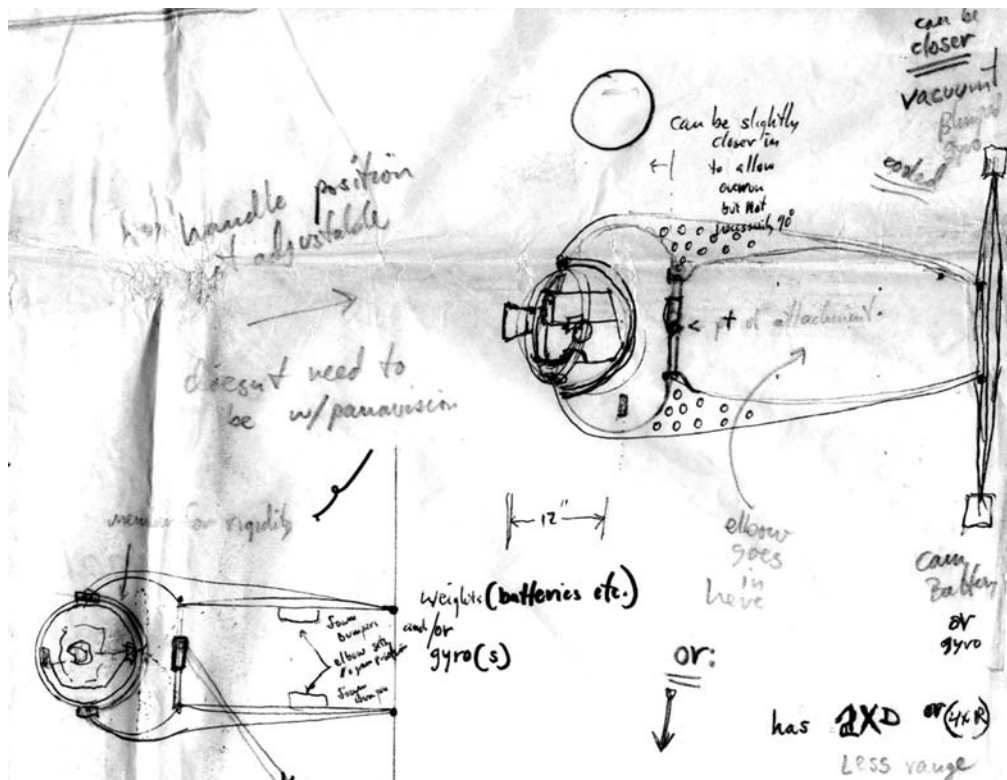
Both drawings showed "gimbals" for isolating objects against angular disturbance.



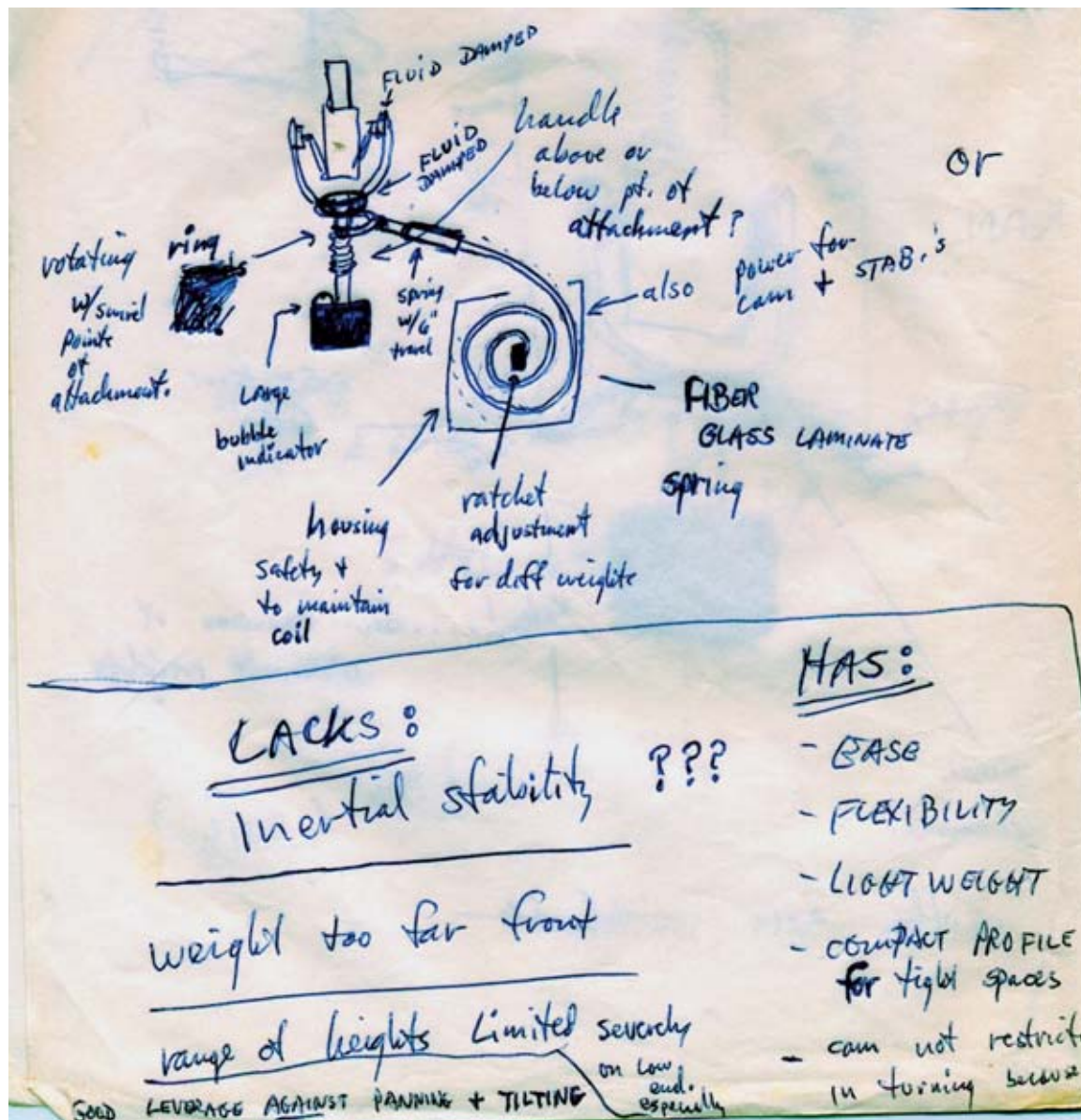
Garrett: "I had dreams about Gottschalk's Panaflex..."

Gimbals are those swiveling, rings-within-rings devices that have held sea-going lamps upright for centuries. I had examined several of them on a boat trip a year earlier and the feeling of carrying that broom at its balance point suggested that a large, balanced, gimbaled object might be oriented by a very small handle and human vibrations would be inconsequential.

Forget that stupid web of gears and belts! To pan the camera, just turn the whole thing! To tilt, angle it up and down with fingertip pressure as it floats beside you on those frictionless bearings. But how could it float? The antigravity effect of the 'bungee through pulleys' scheme was addictive, but it only worked if the camera and its counterweight were arranged fore-and-aft and the center of balance was accessible



Garrett: "One brilliantly compact version turned out to have no magazine at all! (No Problem!)"



Garrett: "The second of those extraordinary sketches showed a huge balance spring, like the slender coil in a pocket watch, but blown up a hundred times..."

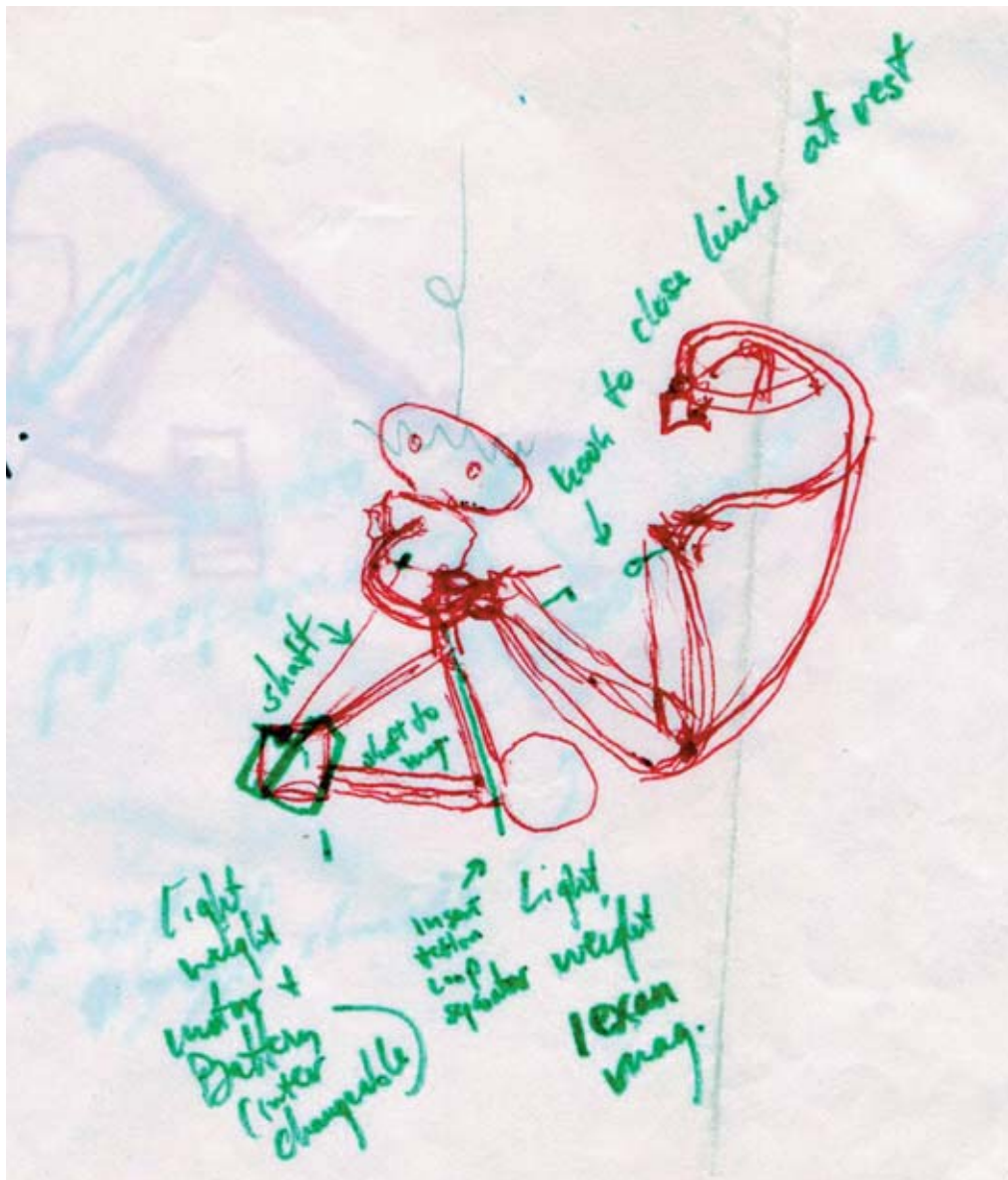
from above. What could suspend a gimbal ring from the side to relieve my hands of the weight and yet preserve that incredible lightness of touch?

The second of those extraordinary sketches showed a huge balance spring, like the slender coil in a pocket watch, but blown up a hundred times and mounted vaguely between the harness and the gimbal so the whole works could bobble in the vicinity of the operator. It looked improbable, but the idea of a mechanized suspension lingered and set me to staring and staring at the desk lamp in my room. It was that well-known type with two spring-loaded parallelogram arms that can be angled anywhere within reach. I learned later that such 'equipoising' arms were perfected in the 1930s by Arne Jacobson of Sweden and the equally prolific George Carwardine of England, and have positioned dental x-ray machines and instrument trays ever since, not to mention those ubiquitous lamps. I spent an hour moving the arms around, the base held

close to various parts of my torso and tried to imagine whether some variation, some inversion, some tireless, frictionless re-configuration might be able to replace the reaching and lifting prowess of the human arm and be connected horizontally to the gimbal.

That afternoon I drove to a department store and bought two more small Jacobson-type lamps and a set of cheap screwdrivers and pliers so I could take them apart, but after I sketched the layout I wearily concluded that this compact version of a stabilizer would never do—it was too small to be very inert and it lacked the floor-to-ceiling boom range of the damned crane. Ultimately, weak-mindedly, I let my attention drift off to ponder bubbles-in-oil and cameras balanced-on-hats-with-springs for two more feverish days and nights.

Finally, on Saturday afternoon, I went back through all of it one last time and there it was again, sitting there in that innocent sketch, and I concluded it was the best I could do. From



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the Holiday Inn in West Chester, Pennsylvania, I brought away a puny but functional model of an arm (made on Sunday morning out of lamp parts) and drawings that showed the whole works: camera, magazine, battery, gimbal and arm, all hanging from the Leo-Pod and intertwined with my fiber optic viewer.

In truth I was quite let down. The thing would probably support a 35mm camera but my weary imagination balked at the complexities of building the arm and I doubted it would ever give the dolly much competition. At best it would be simpler and smaller than the crane and perhaps acceptable for certain kinds of fast-moving shots. I resolved to build just one more gizmo: The CineTurkey II. The Brown-Effect-Lite. The B.E.L.C.H. Whatever.

The great astonishment is that the process, the last chance motel 'retreat,' actually worked—I just didn't yet know it. Not until I viewed the ultimate demo in LA, of Ellen's next and final run down the Art Museum Steps, would I understand

that the job was done. The object conceived during that singular mental sleigh-ride would work exactly like the Steadicam still works today, thirty-four years later, which, to my perpetual amazement, is still the only practical way to stroll around smoothly with a camera. Somewhere near the end of that endless week, the structural requirements that became U.S. Patent number 4,217,268 were set down: The irreducible invention required just four things: increasing the camera's inertia, isolating it angularly, floating its weight, and providing remote viewfinding. Nothing less. Nothing more. I still go to bed hoping that no 'black box' ever does it better!



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Camera Operator Magazine is grateful to have been chosen by Mr Brown to publish more of his autobiography (continued from the Fall/Winter issue of this magazine). We encourage you to send your feedback and comments to Garrett via www.soc.org.



“...the CineTurkey II. The Brown-Effect-Lite. Whatever...”



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