

IN THE MATTER OF
INTERNATIONAL HARVESTER COMPANY

FINAL ORDER, OPINION, ETC. IN REGARD TO VIOLATION OF SEC. 5 OF
THE FEDERAL TRADE COMMISSION ACT

Docket 9147. Complaint, Oct. 10, 1980—Final Order Dec. 21, 1984

This Order affirms in part and reverses in part the 1982 Initial Decision of the Administrative Law Judge ("ALJ") and orders that it be adopted as the "Findings of Fact and Conclusions of Law of the Commission, except as is inconsistent with the accompanying Opinion." The ALJ had ruled that a Chicago, Ill. manufacturer of farm machinery had violated Sec. 5 of the FTCA by failing to adequately disclose to consumers that its gasoline-powered tractors were subject to a safety hazard known as "fuel geysering," even though the company knew of the potential danger. While the Commission agreed that the company's failure to disclose the safety risk constituted an unfair trade practice, it ruled that, contrary to the ALJ's finding, the practice could not, as a matter of law, be considered deceptive since there was no representation, practice or omission likely to mislead consumers found in this case. Although the Commission ruled that the manufacturer has violated the FTCA, it upheld the ALJ's decision not to order further remedial action because the company no longer manufactures gasoline-powered tractors and because the company's 1980 voluntary notification program had already provided as much relief as could be expected from a Commission order.

Appearances

For the Commission: *Richard H. Gateley, Michael Milgrom, Rosemary Rosso, Michael L. Sirota and Cynthia E. Smith.*

For the respondent: *James R. Fruchterman, in-house counsel, Chicago, Ill. and J. Alan Galbraith, Aubrey M. Daniel, III, William E. McDaniels, Carolyn H. Williams and Michael S. Sundermeyer, Williams & Connolly, Wash., D.C.*

COMPLAINT

The Federal Trade Commission, having reason to believe that International Harvester Company, respondent, has violated the Federal Trade Commission Act, and it appearing to the Commission that a proceeding by it in respect thereof would be in the public interest, issues this complaint.

1. Respondent is a Delaware corporation with its executive offices at 401 North Michigan Avenue, Chicago, Illinois.
2. Respondent is now, and has been, engaged in the design, manu-

facture and marketing of agricultural equipment, including but not limited to tractors.

3. Respondent causes agricultural equipment to be shipped to purchasers in various states and, therefore, maintains, and at all times mentioned in this complaint has maintained, a substantial course of trade in or affecting commerce, as "commerce" is defined in the Federal Trade Commission Act. [2]

4. Respondent manufactured approximately 1.6 million gasoline-powered tractors from 1939 through 1975. Such tractors include model numbers such as 300, 350, 400, 450, 600, 656, 706, 756 and 806. The tractors were designed with the fuel tank located in front of the operator above and behind the engine. As many as 800,000 of these tractors may still be in use and be subject to resale by respondent or its dealers.

5. The location, and in some cases the shape, of the fuel tank in such gasoline-powered tractors subjects the tank to fuel heating and vaporization, causing pressure build-up in the fuel tank during normal operation. If the fuel cap is dislodged or removed when the tractor is hot or running, fuel vapors and liquid fuel can shoot or geyser up to 20 feet, spraying the operator or the tractor with gasoline which can, and has, spontaneously ignited. A reasonable likelihood exists that the fuel cap may be dislodged or removed when the tractor is hot or running. In fact, numerous incidents of fuel geysering have occurred on International Harvester tractors. As a result of fuel geysering, some operators of the tractors were severely burned and at least one operator has been killed. In other cases, tractors have exploded as a result of fuel geysering. Fuel geysering, which was not reasonably to be expected by many operators of such tractors, creates a substantial risk of injury or death. Fuel geysering is, therefore, a safety hazard.

6. Beginning in 1955, respondent had information by which it knew, or should have known, that tractors containing fuel tanks located in front of the operator above and behind the engine were subject to fuel geysering due to a pressure build-up in the fuel tanks.

7. Beginning in 1958, if not earlier, respondent determined that a quick release of pressure from the fuel tank, as occurs in removal of the fuel cap, may result in fuel geysering which, in the presence of a hot engine or other means of ignition, can lead to fire.

8. Respondent has failed to disclose adequately the facts concerning the existence of fuel geysering. Respondent has failed to disclose adequately the facts concerning the nature or extent of injuries due to fuel geysering and steps which might be taken to prevent injury or death. Absent adequate disclosures of such facts, some prospective purchasers or some owners or operators of respondent's gasoline-powered tractors have reasonably assumed that fuel geysering does

not occur or that fuel geysering is not a safety hazard. Such facts, if known by many prospective purchasers, would likely affect their considerations of whether to purchase new or used agricultural equipment manufactured by respondent. Such facts, if known by many owners or operators, would likely affect their decisions concerning the use or care of agricultural equipment manufactured by respondent, which could prevent substantial personal or economic injury. Therefore, respondent has failed to disclose material facts. Such failures to disclose constitute deceptive or unfair acts or practices. [3]

9. Respondent's acts and practices in failing to disclose adequately material facts have had, and now have, the capacity and tendency to mislead many members of the public, particularly those who may consider purchasing, or who own or operate, agricultural equipment produced by respondent. Such acts and practices cause and have caused substantial personal or economic harm to many members of the public.

10. Respondent's acts and practices in failing to disclose material facts as alleged herein were and are all to the prejudice and injury of the public and constitute unfair or deceptive acts or practices or unfair methods of competition in or affecting commerce, in violation of Section 5 of the Federal Trade Commission Act, as amended.

STATEMENT OF COMMISSIONER DIXON* DISSENTING FROM
ISSUANCE OF THE COMPLAINT

I agree that the Commission has "reason to believe" that a violation of Section 5 has been committed by International Harvester in this case, but I cannot agree that it is in the public interest for a complaint to issue. International Harvester has already completed the better part of an extensive program to remedy the alleged violation of law and it is unalterably committed by events to take those steps that remain. This remedial program was planned before the Commission began its investigation of International Harvester, and within days of being formally contacted by Commission staff and apprised of their suggestions, International Harvester modified its program to take those suggestions into account.¹

* Paul Rand Dixon, Commissioner 1961-1981.

¹ In stating my reasons for dissenting from the issuance of the complaint, I am mindful that any or all of the matters I discuss may be subject to proof or dispute at the trial, and I shall base any decision I am required to make upon the record developed there. My dissent is based only upon matters that I now have "reason to believe" as a result of the Commission's brief investigation of this case. The evidence before the Commission as to the scope of IH's pre-investigational remedial initiatives is certainly subject to a variety of possible interpretations.

I should also note that I draw no inference whatsoever about IH's liability under Section 5 from the fact that it has chosen to warn farmers about the possible risks of fuel geysering. IH contends that the number of reported geysering incidents (estimated variously as between about 30 and 60) works out to one incident per 500 million tractor operating hours. IH further contends that geysering can occur only when a tractor is running hot and the gas cap is loosened. IH also notes that the incidence of geysering is related to the age of the tractor and the recent

(footnote cont'd)

International Harvester has, however, refused to agree to a consent order requiring it to do what it has already done or will soon do. [2] Under the unusual circumstances described, I would not commit the Commission to the considerable time and expense that litigation entails. I would simply announce the existence of this investigation, announce the program that Harvester long ago began (and modified at our request), and hold that investigatory file open against the exceedingly remote possibility that Harvester fails to complete a program that it has publicly pledged itself to complete to hundreds of thousands of consumers and nearly two thousand dealers.

The Commission's investigation of International Harvester was commenced in late May, 1980. The first formal notification to International Harvester that the investigation had begun occurred in July, 1980. On July 29, 1980, the Commission authorized its staff to seek a preliminary injunction to remedy the alleged violation of law. Before proceeding to court the Commission's staff made substantive contact for the first time with representatives of IH, and learned that the company had begun more than one year earlier to plan a program that would warn of and remedy the danger of fuel geysering.

The program began in Spring, 1979 by International Harvester, and in which it had already expended some millions of dollars, contemplated development of a new gas cap for the pre-1975 model tractors subject to the alleged hazard, provision of the gas cap to dealers, notification of owners of affected tractors as to alleged safety hazards in their operation and the availability of a fix, and follow-up notification in various farm journals.²

Harvester has completed work on the gas cap and is about to distribute it. After being contacted by FTC staff in August, 1980, Harvester adopted various of their suggestions as to the text of a warning letter to be sent to consumers, and mailed more than 600,000 such letters in mid-August. The letters to consumers promise them a free gas cap in exchange for the one presently on their tractors. The letters to Harvester dealers commit Harvester to a follow-up program of media publicity for its replacement program. Given the advanced state of its

increase in the volatility of tractor fuels. All of these asserted considerations may bear upon whether fuel geysering in IH tractors is actually a "safety hazard" and upon whether IH was under any legal obligation to take the steps that it has. While I do join in the Commission's "reason to believe" determination, I also believe that the case is somewhat closer than the necessarily bare-bones assertions in the complaint may suggest.

² While my review of the evidence indicates to me that all of the aforementioned elements were contemplated in the program that Harvester officials began planning in Spring, 1979, I can find no evidence to indicate that they planned to relate the generalized safety message of "gasoline fire hazards" to specific incidents of fuel geysering in early model Harvester tractors. Drawing such a connection, of course, might well increase significantly the seriousness with which any warning would be regarded. Such a connection is drawn in the letters actually mailed by Harvester in August, 1980. To the extent that this may be a product of suggestions by FTC staff members, I think that they are to be commended for this, and for any other changes Harvester may have made in its program in response to staff suggestions. But given that Harvester was in a position to complete the details of an acceptable remedial program within so short a time of FTC intervention I cannot agree that the Commission's involvement necessitates an order.

program, the [3] large investment already made in it, and the commitments publicly undertaken by Harvester in letters to hundreds of thousands of consumers and nearly two thousand dealers, I find no credible basis for doubting that Harvester will complete those steps of its remedial program that have yet to take place.

In the ordinary Commission case, the bulk of what constitutes adequate relief consists of requirements that a company "go and sin no more." In those cases, it is quite reasonable for the Commission to insist that the company's future compliance be guaranteed by an order to cease and desist, carrying with it substantial civil penalties if violated. Relief in such cases consists not of expenditures made in the present but of abstinence from certain acts stretching far into the future. There can clearly be no guarantee that relief of this sort will be achieved without the financial deterrent of an order.

This case is different. Regardless of what one may think of IH's motivations in undertaking its gas cap program, it seems to me that it has been undertaken (long before the Commission intervened) and is now in its final stages. There is no conclusion to question whether an order is needed to secure effective relief; that relief is largely secured. In what way, then, will the substantial expenditure of funds that any litigation entails benefit consumers in this case?³

It might be argued that it sets a poor precedent and undermines law enforcement efforts in other cases for the Commission not to place under order a respondent that has allegedly violated the law in a serious way. So far as I can see, however, the only precedent established by not litigating this case would be that anytime the Commission begins an investigation and finds that the investigated party has long had underway a remedial program which it conforms to FTC standards immediately upon being first contacted by FTC staff, the Commission will not insist that the provision of such relief to consumers be celebrated by the issuance of an order to cease and desist. Far from being an occurrence to dread, such immediate voluntary compliance strikes me as an occurrence to welcome. I would gladly see the Commission issue fewer orders if that meant more immediate but still effective relief for the victims of alleged safety hazards.⁴ [4]

Where effective relief is achieved by a company without substantial Commission involvement, the Commission must seriously consider

³ The Notice of Contemplated Relief attached to the Commission's complaint does indicate that the Commission may order that IH desist from failing to notify of any future hazards in its tractors, if it is found in violation of Section 5. The Commission has not, however, routinely insisted upon such prospective orders in cases of this kind for various reasons, and in this case such relief seems unnecessary.

⁴ It may be argued that the violation alleged here has continued for many years, and was remedied by IH for other than eleemosynary reasons. Assuming *arguendo* that this is true, it seems to be irrelevant. The only proper purpose of a Commission order is to relieve. The past conduct of an alleged violator may be probative of whether it can be expected to undertake voluntary remedial steps in the future absent an order. But where expensive relief has *already* been undertaken, I cannot see how it makes any difference to any proper concern of the Commission's whether the violation has been long-lived or not.

conserving its scarce resources for cases where they will do more good. In my opinion, the lawsuit being undertaken today will do little or nothing to augment the protections already being afforded owners of IH tractors, nor will it serve to vindicate any broader principle of sound law enforcement that I can discern. Therefore, I would make public what has transpired but not issue the complaint.

October 10, 1980

INITIAL DECISION BY

JOHN J. MATHIAS, ADMINISTRATIVE LAW JUDGE

JULY 16, 1982

PRELIMINARY STATEMENT

The Complaint in this matter was filed on October 10, 1980, and charged International Harvester Company (IH), a corporation engaged in the design, manufacture and marketing of agricultural equipment, including tractors, with failure to disclose material facts to operators of tractors which it manufactured, in violation of Section 5 of the Federal Trade Commission Act, as amended (Complaint, ¶ 10).

The gravamen of the charges against respondent is that gasoline-powered tractors which it manufactured since 1939, having the fuel tank located in front of the operator and between the operator and the engine, are subject to a safety hazard which has been termed "fuel geysering." It is alleged that in all of such tractors "the location, and in some cases the shape of the fuel tank, . . . subjects the tank to fuel [2] heating and vaporization causing pressure build-up in the fuel tank during normal operations." It is further alleged that "[i]f the fuel cap is dislodged or removed while the tractor is hot or running, fuel vapors and liquid fuel can shoot or geyser" out of the fuel tank "spraying the operator or the tractor with gasoline which can, and has, spontaneously ignited." Such phenomenon, it is alleged, can and has resulted in serious injury, and even death, is not reasonably to be expected by "many operators," and is, therefore, a "safety hazard" (Complaint, ¶ 5).

It is further alleged that respondent was aware of this problem in 1958, or earlier, and failed to adequately disclose the facts concerning "the nature or extent of injuries due to fuel geysering and steps which might be taken to prevent injury or death." It is charged that if the facts concerning pressure build-up and fuel geysering had been known by many operators it "would likely affect their decisions con-

cerning the use or care of agricultural equipment manufactured by respondent. . . .” As to prospective purchasers of new or used tractors manufactured by respondent, it is urged that if they knew such facts it might affect their decision to purchase that equipment. It is therefore alleged that respondent’s failures to disclose this information constitute deceptive or unfair acts or practices or unfair methods of competition in or affecting commerce (Complaint, ¶ 8).

The Complaint does not allege that respondent’s gasoline-powered tractors were defective, nor does the Complaint charge that respondent’s tractors represented anything other than the state of the art in the design and manufacture of tractors for farm use during the periods when they were manufactured.

Respondent generally denies the allegations of the Complaint, but it admits that incidents alleged to have involved fuel geysering have occurred on IH tractors and that injuries and one death have occurred in such incidents. It specifically denies, among other things, that fuel geysering can occur during the normal operation of its tractors, that such incidents are numerous, and “that fuel geysering can or will occur on any IH gasoline-powered tractor if the operator securely tightens the cap, the gas cap is in reasonable working order and the operator abides by the basic safety instruction not to remove the gas cap when the engine is running or hot.” It admits that if fuel geysering does occur, it is a safety hazard (Answer, ¶ 4). It also raises a number of affirmative defenses in its answer, which range from contesting the Commission’s jurisdiction to allegations that the proceeding is moot. [3]

The principal issues presented for hearing were:

1. Does fuel geysering occur on IH gasoline-powered tractors due to pressure build-up which occurs during the normal operation of such tractors?
2. Are there basic safety rules which, if followed, would prevent fuel geysering?
3. Were those basic safety rules so obvious and well-known that all operators of gasoline-powered tractors should have been aware of them and followed them?
4. Under the circumstances revealed by the evidence, was respondent’s knowledge of alleged fuel geysering incidents and the phenomena which could give rise thereto, such that it imposed a duty on IH to disclose this safety hazard to users and prospective users of its gasoline-powered tractors?
5. If there was a duty to disclose, did IH’s actions at any particular point in time discharge that duty under the conditions existing at the time?

FEDERAL TRADE COMMISSION DECISIONS

Initial Decision

104 F.T.C.

6. Have the users of IH's gasoline-powered tractors now been adequately warned of the safety hazard of fuel geysering?

7. Has there been a violation of Section 5 of the Federal Trade Commission Act and, if so, what, if any, kind of order is required?

The hearing in this matter commenced on Tuesday, October 13, 1981, and the record was closed on Friday, February 26, 1982. During the course of their case-in-chief and rebuttal complaint counsel called 26 witnesses and introduced well over 300 exhibits into evidence. Respondent in its defense called 24 witnesses and introduced into evidence about 200 exhibits. The hearings consumed a total of 34 trial days and 5662 pages of transcript.

This initial decision is based upon the entire record including proposed findings of fact and conclusions of law and supporting memoranda filed by the parties, as well as their replies. I have also taken into account my observation of the witnesses who appeared before me and their demeanor. Proposed findings not herein adopted, either in the form submitted or in substance, are rejected either as not supported by the evidence or as involving immaterial matters. [4]

The findings of fact include references to supporting evidentiary items in the record. Such references are intended to serve as guides to the testimony and exhibits supporting the findings of fact. They do not necessarily represent complete summaries of the evidence supporting each finding. The following abbreviations have been used:

- Tr. - Transcript, preceded by the name of the witness and followed by the page number.
- CX - Complaint Counsel's Exhibit, followed by its number and the referenced page(s).
- RX - Respondent's Exhibit followed by its number and the referenced page(s).
- CF - Complaint Counsel's Proposed Findings.
- CB - Complaint Counsel's Memorandum Of Law In Support Of Proposed Findings.
- RF - Respondent's Proposed Findings.
- RB - Respondent's Memorandum Of Law In Support Of Proposed Findings.
- CRF - Complaint Counsel's Reply To Respondent's Proposed Findings.
- CRB - Complaint Counsel's Reply Brief.
- RRF - Respondent's Reply To Complaint Counsel's Proposed Findings.
- RRB - Respondent's Reply Brief.

FINDINGS OF FACT

I. THE RESPONDENT

1. International Harvester Company is a Delaware Corporation with its executive offices located at 401 North Michigan Avenue, Chicago, Illinois. Respondent is engaged in the design, manufacture, and marketing of three major product [5] lines: agricultural equipment, construction machinery and highway trucks. IH and its corporate predecessors have been major suppliers of farm machinery since the 1840's. Its agricultural equipment line includes, among other things, tractors (Complaint and Answer, ¶¶ 1, 2; Colwell, Tr. 3635; McCormick, Tr. 1492-93; RX 49, p. 153).

2. IH built its first farm tractor in 1906. Since then it has been a pioneer in the development of the agricultural tractor. In 1939, it introduced a new gasoline-powered tractor, the Farmall "M", which was geared to modern power farming and gave the farmer the capacity to perform a wide variety of farming tasks by mounting different power-driven implements on his tractor. The Farmall line also included the model "A" and "H" tractors. These basic models, with some improvements over the years, were IH's primary farm tractors through 1954. Beginning in 1955, IH also marketed a line of utility tractors. The utility tractors had a lower profile and were closer to the ground. They were suitable for many farming chores. Since the mid-1950's respondent has built many different models of tractors, generally of increasing size and horsepower (RX 49, pp. 154-62; RX 89H-I; Coleman, Tr. 963, 967, 1051, 1318-20, 1329-36; Link, Tr. 1995; Borghoff, Tr. 4000-02).

II. COMMERCE

3. IH distributes and at all relevant times distributed, agricultural equipment including tractors and accessories and parts therefor through its independent dealer organization. In the late 1940's there were 7000 dealers in North America (including Canada), but the overall number of dealerships has since declined and the dealerships have become larger. As of today there are about 2000 of such dealers in the United States and Canada. Respondent also sells its agricultural equipment through a few company-owned retail stores. As of October 1980 there were 10 of such company-owned stores. These were located in the states of New York, Alabama, Mississippi, Kansas, Oklahoma and Texas (RX 220; Gast, Tr. 3749-50; Hartzell, Tr. 2950-51; Hill, Tr. 3834; Allen, Tr. 3684; *Affidavit of James R. Fruchterman, attached to Motion to Dismiss for Absence of Conduct in Commerce*, February 6, 1981).

4. IH causes the agricultural equipment, including tractors, accessories and parts to be shipped from the place of manufacture to independent dealerships and its own retail stores in the various states, including states other than the place of manufacture. Such tractors, accessories and parts are then sold by the dealerships and the company-owned stores to customers in their respective sales areas. The number of gasoline-powered [6] tractors manufactured and sold by IH declined precipitously in the 1970's. Respondent has not manufactured and shipped any gasoline-powered tractors since 1978. It does continue to print owner's manuals and supply accessories and parts for the tractors which have gone out of production and distribute these through the normal distribution channels in interstate commerce. It also prints, and distributes interstate, parts catalogues for such tractors, which parts catalogues are sent through its mailing list to farmers in the various states urging them to purchase parts and equipment through the dealerships and stores (Complaint and Answer, ¶¶ 3, 4; CX 219A-B; CX 221; CX 269; CX 269-Z-96; CX 270K; CX 272K; CX 351; RX 5 (p. 7); RX 26 (p. 16); RX 26 (p. 29); RX 89H-I; RX 211; RX 220; Bennett, Tr. 3161, 3240-41; Lirtzman, Tr. 4707-09).

5. It is alleged in the Complaint that a substantial number of respondent's gasoline-powered tractors "may still be in use and be subject to resale by respondent [through its company-owned retail stores] or its dealers." The only evidence in the record concerning the sale of used gasoline-powered tractors in IH's company-owned stores is an affidavit of James R. Fruchterman, reporting on a survey of the 10 company-owned retail stores made in the Fall of 1980, which showed that as of October 21, 1980, there were, collectively, five used gasoline-powered tractors in inventory in said stores. No other evidence was introduced by complaint counsel to show any other course of dealings in such tractors by the company-owned stores. Therefore, respondent's dealings in used tractors must be considered *de minimis* (Affidavit of James R. Fruchterman, attached to Motion to Dismiss for Absence of Conduct in Commerce, February 6, 1981).

6. However, based on the evidence cited in Findings 3 and 4 above, I find that respondent has, at all times relevant to the Complaint, been engaged in a substantial course of trade or commerce, as defined in the Federal Trade Commission Act, with respect to the tractors which are the subject of the Complaint (*See also*, RX 89H-I).

7. In the course and conduct of such business in commerce, at all times relevant to the charges of the Complaint, respondent IH has been and is now in substantial competition in commerce with corporations, firms and individuals engaged in the manufacture, sale and distribution of agricultural equipment, including tractors (RX 49A; Coleman, Tr. 1321-23).

INTERNATIONAL HARVESTER CO.

949

Initial Decision

III. RESPONDENT'S GASOLINE-POWERED TRACTORS

8. The evidence in this case was limited to respondent's gasoline-powered tractors over 25 horsepower used in farm [7] operations, the fuel tanks of which were located between the engine and the operator. This excludes all tractors designed for home use and industrial tractors, as well as a number of gasoline-powered tractors which IH manufactured in the later part of the complaint period, which had the fuel tank located behind the operator (*Order Respecting Complaint Counsel's Subpoena Duces Tecum*, January 21, 1981; RX 89H-I; CX 221). The model designation of the tractors in issue, as well as the years during which they were built are as follows:

Model	Years Built
A, AI, AV, B, SA, SAI, SAV	1939-1955
100 and 130	1955-1957
140	1958-1978
C and SC	1948-1954
H, M, SMTA, W-4, W-6, SH,	
SM, SW-4, SW-6	1939-1954
200	1954-1955
F-230	1957
F-300	1955-1956
I-300	1955-1956
F-400	1955-1956
I-400	1955-1956
I-350	1957-1958
F-350	1957-1958
I-330	1956
F and I-240	1958-1961
F and I-404, 2404	1962-1967
424, 2424	1956-1967
444, 2444	1968-1971
F-450	1956-1958 [8]
I-450	1956-1958
I-340	1958-1963
F-340	1958-1963
I-504, 2504	
2500 Constructall	1963-1967
I-600	1956
I-650	1957
F-504	1960-1967
I-460	1958-1963
F-460	1958-1963

FEDERAL TRADE COMMISSION DECISIONS

Initial Decision

104 F.T.C.

<u>Model</u>	<u>Years Built</u>
F and I-560	1958-1963
I-660	1958-1963
I-606	1964-1967
F-544	1968-1973
I-544, 2544	1968-1973
I-656, 2656	1968-1973
F-656	1965-1971
F and I-706, I-2706	1963-1967
F and I-806, I-2806	1963-1967
F and I-856, I-2856	1967-1970
F-666, Hydro 70	1972-1975
686, Hydro 86	1976-1978
F-766	1971-1976
F and I-826, I-2826	1969-1971
F and I-756, I-2756	1967-1970
(RX 89H-I). [9]	

The models preceded by the letter "F" are of the Farmall line, while those preceded by the letter "I" are of the utility line of tractors (Coleman, Tr. 1051, 1329-31). During the period 1939 to 1978, IH built a total of 1,363,063 of the tractors listed above (RX 89H-I).

9. Although all of the tractors listed in Finding 8, above, had the fuel tank located between the operator and the engine (CX 219A-U; CX 221A-C; Coleman, Tr. 971-72), where were substantial differences in design and horsepower among such tractors (CX 219A-U; Link, Tr. 1995). However, within the above list, various of the tractors can be grouped together with respect to their design, insofar as the type of fuel tank and its location in relation to the engine and operator's seat are concerned. The first seven tractors and groups of tractors listed above, down through F-230, had the same teardrop fuel tank, not covered by the hood, located in the same location between the engine and the operator's seat, (CX 219A; CX 221A; Coleman, Tr. 971), except that the 4 and 6 models in the fifth group have a different seat location (CX 219A). The 240 model is essentially the same as the 340. Models B-275, B-414, 404, 444 and I-504 are essentially the same as Model 424. The I-300 and 330 are essentially the same as the I-350 and the F-300 is essentially the same as the F-350. F and I-400's are essentially the same as the F-450. The F-460 is essentially the same as the F-560, and the I-460 as the I-560. Models I-544 and I-606 are essentially the same as the I-656. The F-666, 686, the Hydro 70 and Hydro 86 are essentially the same as the F-656. The F-504 is essentially the same as the F-544. Models 766 and 826 are essentially the same as Model 756. The I-806, I-856 and I-756 are essentially the

same as the I-706. The 600 and 650 are essentially the same as the "M", and the 660 is the same as the 560, except for the seat location (CX 219A-U).

IV. FUEL HEATING, VAPORIZATION AND PRESSURE BUILD-UP

10. In all of the tractors listed in Finding No. 8, above, the location of the fuel tank subjects it and the gasoline within it to additional heat from the engine during the normal operation of the tractor. This is due both to the radiator fan blast and radiation from the engine.¹ (Creighton, Tr. 2245; [10] CX 43C-D; CX 47; CX 51; CX 55 through 58). Most of the models of IH gasoline-powered tractors where the fuel tank is enclosed by a cowling also include a heat shield which lowers the fuel tank temperatures somewhat. The heat shield is designed to deflect the radiator fan blast away from the tank. However, this shield primarily delays the heating process. The fuel tanks which are so equipped still suffer from temperature rise well above the ambient temperature, when the tractor is operated for a substantial period of time (Link, Tr. 2025-26; Den Besten, Tr. 1794; CX 19B, CX 46A; CX 48D; CX 51A-B; CX 55D; CX 56D-E; CX 58B; CX 81A-B; CX 382A-C).

11. The heat from the engine reaching the fuel tank can increase the temperature of the fuel as much as 65° F. above that of the ambient air (CX 16D-E; CX 17A-B; CX 19A-B; CX 43Q; Coleman, Tr. 1069, 1072, 1076; Den Besten, Tr. 1805; RRF 90). Engine heat can increase fuel temperature by 69° F. in three hours, even when the tank is equipped with a heat deflector (CX 382A-C; RRF 90). Even after the engine is stopped, fuel tank temperatures may continue to rise for a time, because of the residual heat stored in the engine (CX 79B; CX 379, Ziskal Dep., pp. 104-105; Coleman, Tr. 1209-10; RRF 90).

12. As the temperature of the gasoline in the fuel tank rises, it begins to vaporize. Gasoline is a blend of various hydrocarbons beginning with those with four carbon atoms, up through hydrocarbons with 9 or 10 carbon atoms. Those hydrocarbons with the lowest number of carbon atoms, the butanes and pentanes, are known as the "light ends." These "light ends" have a dominant influence on fuel volatility. The "light ends" begin to vaporize at about 95-97° F. (Creighton, Tr. 2271-72; Hurn, Tr. 3899-3900; CX 379, Ziskal Dep., pp. 27-34).

13. When the gasoline in the tank vaporizes more rapidly than it can be vented by the cap, pressure builds up in the fuel tank (CX 16D-E; CX 17; CX 19A-B; CX 43Q; CX 44A; CX 55B; CX 58; CX 64A; Creighton, Tr. 2207; RRF 93).

14. Other things also have an effect on the degree to which pressure

¹ The radiator fan blast is a stream of hot air blown away from the engine by the radiator fan (Creighton, Tr. 2245).

is built up in the fuel tank. Agitation of the fuel, which occurs during normal operations as the tractor is driven over rough ground, can temporarily increase pressure in the fuel tank as much as 50% to 100% (CX 46C; RX 32, p. B-80; Creighton, Tr. 2251-53; Coleman, Tr. 1174-75). The shape and size of the fuel tank can also affect fuel heating and fuel pressure (RRF 97). Heat and consequent pressure build-up are also affected by external conditions. The velocity and direction of the wind and radiant heat from the sun can have an important effect on the temperature of the fuel and the resultant pressure build-up in the fuel tank (Creighton, Tr. 2253-54; Coleman, Tr. 1010; RRF 98). Although pressure build-up can occur at widely disparate temperature ranges of the outside air, the [11] ambient air temperature can also play an important part in raising the temperature of the fuel in the tank, and, consequently, the pressure within the tank (CX 208J; Hartzell, Tr. 2963-64). Some equipment or accessories mounted on the tractor, such as corn pickers, heat housers and front end loaders, tend to trap heat near the engine and fuel tank and can also be factors in raising the temperature of the fuel and causing pressure build-up (CX 379, Ziskal Dep., pp. 29-30, 41).

15. Fuel volatility is also a very important factor in pressure build-up in the fuel tanks of these tractors. A more volatile fuel is more hazardous because it has an increased tendency to form vapors and the more vapor that is discharged into a contained vessel at any given temperature, the greater the potential for pressure build-up within the container. There is also more opportunity for fire with a fuel of higher volatility (Hurn, Tr. 3935-36). Gasoline volatility has been generally increasing since the 1930's (Hurn, Tr. 3924, 3957, 3967). For example, the volatility of gasoline produced in the Spring in the Midwest has increased by 20% during the period 1965 to 1980 (CX 153).

16. The volatility of fuel is also greatly affected by the practice of refiners to produce different blends of gasoline for the different seasons of the year. Winter fuel is more volatile in order to improve starting capability (Hurn, Tr. 3899-3902). However, pressure build-up in the fuel tanks of the tractors at issue can occur even when summer-grade gasoline is used (Hartzell, Tr. 2979).

17. Other factors can also affect the amount of pressure build-up in the fuel tank of these tractors. The venting capacity of the fuel cap can affect the pressure in the tank. If the vent hole is plugged with dirt, or missing, then vapor cannot escape from the tank at all and pressure build-up is greatly increased (CX 38; CX 49B; CX 68; CX 69B; Reed, Tr. 3027-28). Tractor maintenance can also play an important part in increasing the temperature to which the fuel tank is subjected and, thus, the pressure build-up within it. A poorly maintained trac-

tor may expose the fuel tank to a greater amount of heat (RX 220B; Bennett, Tr. 3187; Allen, Tr. 3690-91).

18. Some of the symptoms which accompany the pressure build-up in the fuel tanks of the IH tractors are: boiling of the gasoline in the fuel tanks (Coleman, Tr. 1069, 1072; Nichols, Tr. 2092; CX 24A; CX 27B; CX 44A; CX 45A; CX 90; CX 112; CX 163A; CX 171B); a hissing sound created by the gasoline vapors escaping through the vent in the filler cap (CX 35A; Creighton, Tr. 2276; Didion, Tr. 673; Clowes, Tr. 1834-36; Cox, Tr. 830; Holtz, Tr. 718-19); "vapor lock" caused by fuel vaporizing in the fuel line or carburetor, which can cause the [12] engine to sputter or "die" (CX 35; CX 80; RX 25Y; Creighton, Tr. 2777); surging of the engine, because the pressure forces too much fuel into the carburetor (Coleman, Tr. 1015-16; Creighton, Tr. 2295); stalling of the engine due to flooding, when the pressure forces too much fuel into the carburetor (Coleman, Tr. 1003); and gas squirting out of the vent hole of the fuel cap (CX 46A; CX 119A; CX 177; Coleman, Tr. 999-1000, 1004-05, 1012; Cameron, Tr. 401).

V. FUEL GEYSERING

19. When sufficient pressure has been built up in the fuel tank and it is suddenly released, such as when the gas cap is suddenly removed from a hot or running tractor, there may be a sudden ejection or expulsion of gasoline and gasoline vapors out of the filler neck. Such ejection or expulsion has sometimes been called "fuel geysering." As used in this case, the term "fuel geysering" has included varying degrees of fuel loss, ranging from a spray to a solid column of gasoline (Creighton, Tr. 2190; Coleman, Tr. 1077, 1140, 1337; CX 44; CX 250 through 254; CX 375A-B; RRF 86). Fuel geysering involves the release of energy accumulated in the liquid mass of the fuel as boiling is suppressed by built-up vapor pressure (Coleman, Tr. 1142).

20. Fuel geysering can occur when pressure exceeds 1 pound per square inch (psi) in the fuel tank (CX 46B). Tank pressures as high as 5 psi can be attained during the normal operation of one of the subject tractors (Hillstrom, Tr. 3553; Den Besten, Tr. 1805; CX 44A-B; CX 46A-P; CX 55A-B; CX 56A; CX 57A; CX 58A-B; Findings No. 66, 69, 71, 76-80, 82-83, 85, 88, 96, 99-101, below).

21. Geysering is affected by the level of fuel in the tank. Generally, fuel tank pressure follows a curve in which it increases gradually to a peak, then decreases as more of the fuel is used up (CX 57F-H; RX 267M-N; CX 379, Ziskal Dep., p. 27; Coleman, Tr. 1681; RRF 103).

22. Fuel geysering is the result of a combination of circumstances involving pressure build-up, fuel temperature, the amount of fuel in the tank and the sudden release of the pressure in the tank (Reed, Tr. 3024-30; RRF 103; Findings No. 19-21 above). Respondent admits

that under some combination of circumstances fuel geysering could occur on all of the IH gasoline-powered tractors listed in Finding No. 8, *supra* (CX 216D; RRF 86, 103).

23. A "fuel geyser" can result in the expulsion of a stream of vapor and liquid fuel to a height well above the tractor and its operator (Buatte, Tr. 149; Cameron, Tr. 401; Didion, Tr. 675). Fuel gushed 20 feet high and fuel loss was seven [13] gallons, when IH tested one of its production tractors at a fuel tank pressure of 2 psi with the tank 3/4 full (CX 46B). One farmer who experienced fuel geysering said, "It was frothy-looking—it appeared to be like a frothy-looking orangeish white mass, and it just went up like that" (Cameron, Tr. 402). Another described the release of pressure when he removed the cap by stating, "You couldn't put any more pressure in there with an air hose. . . ." (Shawback, Tr. 583). Other farmers tried to put the cap back on the filler neck, but were unable to because of the pressure (Great-house, Tr. 201).

24. The fuel expelled from the tank may fall on the operator soaking him with gasoline (CX 28; Buatte, Tr. 148-49; Cameron, Tr. 400-02; Shawback, Tr. 582). Even if the fuel does not spray directly on the operator, he can be burned if it ignites (Kangas, Tr. 489-93; Great-house, Tr. 201-02).

25. The fuel which is ejected from the tank of a hot or running tractor can ignite in several ways. Fuel ignition can occur if the tractor is hot (CX 29D). The auto ignition temperature of gasoline (that is, the temperature at which gasoline will ignite without a spark or an open flame, also known as spontaneous ignition) is 800°-860° F. The exhaust manifold of the tractor can reach temperatures as high as 1,200° F. Other sources of ignition include: sparks from the commutator brushes on the generator, or from the muffler (CX 28D; CX 36H; CX 379, Ziskal Dep., pp. 46, 49; Coleman, Tr. 1211; RX 27-4; Creighton, Tr. 2280-85, 2292-94), and bits of dirt and chaff which can get on hot parts of the tractor during operation and serve as sources of ignition (Sullivan, Tr. 5138; CX 379, Ziskal Dep., p. 42). Ignition will not occur every time liquid gasoline comes in contact with a hot or running tractor, but it is always a possibility (Creighton, Tr. 2292-94).

26. Ignition can occur almost simultaneously with the release of fuel. One witness testified that:

. . . [w]hen I opened the gas cap up, gas shot in the air. It said "Whoosh" and gas went about two and a half, three feet. Then I tried forcing the cover back on, but it was all engulfed in flames right away, as soon as the gas came out. (Wholetz, Tr. 634.)

Wayne Shawback said:

Well, the minute I got sprayed with gas, I reached for the switch to shut the motor off. But that time, it had ignited. I was one ball of fire. (Shawback, Tr. 583). [14]

27. Fuel geysering can result in serious injury, and even death. It is undisputed that Charles Kraus died as a result of a fuel geysering incident in 1978 (CX 308; Creighton, Tr. 2237-39; Bennett, Tr. 3356-57). Eleven other incidents about which there was testimony at trial resulted in serious injury (Buatte, Tr. 149; Greathouse, Tr. 208-10; Cameron, Tr. 405-09; Kangas, Tr. 489-93; Shawback, Tr. 584-85; Wohletz, Tr. 635; Didion, Tr. 675; Holtz, Tr. 720; D. Jolicoeur, Tr. 765; S. Jolicoeur, Tr. 818-19; Cox, Tr. 832; Clowes, Tr. 1838). In one incident related at trial, the operator escaped relatively uninjured, but the fuel exploded and the tractor was heavily damaged (Guynn, Tr. 890, 903-04, 908-09; CX 265; CX 266; CX 267). IH acknowledges that one, perhaps two, additional deaths have occurred in "alleged" fuel geysering incidents (*Answer*, ¶ 5; CX 220A-K; *Supplemental Memorandum in Opposition to Complaint Counsel's Motions for Leave to Submit Additional Evidence on the Issue of Public Interest*, July 21, 1981, pp. 9-11).

28. Although a number of fuel geysering incidents did not involve personal injury, those which did often resulted in extremely serious burns, disfigurement and permanent impairment (Buatte, Tr. 175; Greathouse, Tr. 208-10; Cameron, Tr. 405-09; Wohletz, Tr. 635; Didion, Tr. 675; Holtz, Tr. 720-21; S. Jolicoeur, Tr. 818-19; Cox, Tr. 832-33; Clowes, Tr. 1837-38).²

29. The record contains evidence of more than 90 alleged fuel geysering incidents involving respondent's tractors which occurred from the mid-1950's through August 1981 (CX 24A; CX 48D; CX 53; CX 220; CX 409; CX 410; Sullivan, Tr. 5159; Rezek, Tr. 3102; Nichols, Tr. 2092-93; Clowes, Tr. 1840). Moreover, one early report (1955) simply states that complaints had been received by IH "stating the owners were sprayed with gasoline when removing the fuel cap due to pressure build-up in the fuel tank" (CX 19A). Obviously this indicates more than one occurrence, but whether it represents many, or few, cannot be determined. Then too, some of respondent's files on early incidents were lost or discarded, so it is possible that some [15] fuel geysering incidents which were reported to IH are not identified on this record (Bennett, Tr. 3289-90, 3323-25; CX 44A; CX 48D). Some fuel geysering accidents were not reported to respondent (Bennett, Tr. 3361-64; CX 440; RX 254A-H), and others are reported years after the occurrence (CX 379, Ziskal Dep., p. 84; CX 440). Therefore, the num-

² I curtailed complaint counsel's examination of injured witnesses in an off-the-record discussion with counsel, very early in the hearings, since it obviously caused some of the witnesses mental anguish to testify as to the extent of their injuries and since such testimony was unnecessary. It was obvious from seeing some of the witnesses that they had been severely injured and disfigured.

ber of fuel geysering incidents established on the record herein cannot be considered a complete enumeration of all such accidents.

30. Respondent points out in its Reply to Complaint Counsel's Proposed Findings that CX 220, an affidavit of an IH official and a supplement thereto, which is the principal listing of alleged fuel geysering incidents in this record, contains as many as four accidents which did not involve "fuel geysering," but rather involved fuel "spurts" (gas squirting through the vent hole) (RRF 119). Such fact does not materially affect the number of fuel geysering incidents as listed in Finding No. 29, above. Further, respondent urges that a number of the other accidents reported as "fuel geysering" may not have involved that phenomenon. However, I find that the weight of the evidence establishes that all of the incidents to which there was direct testimony offered herein by operators involved in such accidents, with the exception of the Killingbeck incident, were "fuel geysering" incidents (Buatte, Tr. 146-82; Greathouse, Tr. 183-235; Cameron, Tr. 352-448; Kangas, Tr. 477-568; Shawback, Tr. 569-611; Wohletz, Tr. 624-59; Didion, Tr. 662-707; Holtz, Tr. 709-43; D. Jolicoeur, Tr. 752-811; S. Jolicoeur, Tr. 812-21; Cox, Tr. 823-39; Guynn, Tr. 870-941; Clowes, Tr. 1825-70; Nichols, Tr. 2085-2117). In addition, the weight of the documentary evidence of record indicates that fuel geysering was definitely involved in the Bedke, Binder, VandenHoek, and Ostendorf accidents (CX 28A-G; CX 40; CX 144A; RX 262). Based on these established cases of fuel geysering and respondent's admissions that the other incidents counted in Finding No. 29, *supra*, were alleged fuel geysering incidents (with the exception of as many as four, as mentioned above), I can only draw the inference that all of the accidents referred to in Finding No. 29 actually involved "fuel geysering" (RRF 119, 120).

31. Of the fuel geysering incidents established in the record: more than seven were reported to IH which occurred during the latter half of the 1950's (over four of these were prior to May 1958) (CX 19A; CX 220); at least 25 were reported to respondent as occurring in the 1960's (CX 24A; CX 48D; CX 220);³ at least 30 were reported which occurred in the [16] 1970's (CX 220); at least 24 were reported which occurred in 1980 and 1981 (CX 220); and at least seven were reported whose date of occurrence is unknown (CX 220).⁴

32. Under the definition of "fuel geysering" adopted herein, gasoline and gasoline vapors are expelled or ejected out of the fuel tank

³ CX 48D mentions that 11 of such incidents were reported in connection with IH's 460 and 560 tractors (manufactured from 1958 to 1963) by the date of the meeting reported therein—March 4, 1961. No date or other information is given regarding these incidents. Since they certainly occurred in the late 1950's or early 1960's, all are credited to the 1960's.

⁴ These include as many as four "spurting" incidents (RRF 119). However, since the figures for the 1950's do not take into account all of the incidents referred to in CX 19A and CX 44A, which allude to "field complaints" and "field reports," the total number of incidents established on the record is undoubtedly still over 90.

filler neck when the fuel cap is removed or dislodged (Complaint ¶ 5; Finding No. 19, *supra*). The weight of the evidence in this record establishes that a *properly secured* fuel cap cannot be dislodged or "blown off" (CX 27A-E; CX 46A-R; CX 67A-B; CX 68A; CX 69A-C; CX 108A-F; CX 109A-F; *Concessions of complaint counsel*, Tr. 2362, 2408, *Transcript of telephone conference* of May 7, 1982). The weight of the evidence also establishes that the fuel cap can be removed or dislodged if the operator physically removes it (CX 116), or if an improperly secured cap vibrates off during the operation of the tractor (*see* Finding No. 33, below).

33. The only inference I can draw from this record is that an *improperly secured* gas cap can vibrate off a running tractor. (This includes the situation where the cap or filler neck are so poorly maintained that the cap cannot be properly secured). Several witnesses appeared before me and testified that the fuel cap came off while their tractor was running, without their having touched it (Buatte, Tr. 147-49; Cameron, Tr. 401, 404; D. Jolicoeur, Tr. 763-66; Guynn, Tr. 889-99). I find no basis to doubt their credibility.⁵ At the same time, I am precluded by this record, including complaint counsel's [17] concessions, from finding that a properly secured gas cap can "blow off" one of respondent's tractors (*See* Finding 32). However, an expert who testified for respondent in connection with private litigation concluded that an improperly secured fuel cap can vibrate off a running tractor (RX 262J; CX 291H-I; *see also*, CX 28A, CX 52A and Answer ¶ 5) and other evidence indicates that a fuel cap or filler neck might be so poorly maintained by a tractor owner that the cap fits loosely on the filler neck (Cameron, Tr. 442; Nelson, Tr. 4389; Sullivan, Tr. 5120, 5126, 5128-30; Answer ¶ 5), thus giving rise to the inference that the fuel cap might vibrate off under such circumstances. This evidence, coupled with the testimony of Messrs. Buatte, Cameron, Jolicoeur and Guynn, as well as evidence from IH's files that others have made similar claims of blow-offs (CX 28A; CX 44A; CX 61A; CX 119A), gives rise to the inference that a fuel cap can vibrate off the tractor under these conditions and that a fuel geyser might result if the other causal factors are present.

34. There is a reasonable likelihood that the fuel cap on one of respondent's gasoline-powered tractors may be removed or dislodged when the tractor is hot or running. The number of fuel geysers

⁵ For example, respondent contends that Mr. Guynn must have removed the fuel cap and placed it on the right fender, since the physical evidence shows it sat there during the fire (RRF 138). However, it is not beyond belief that a fuel cap blown off a tractor and up into the air might come back down and land on the tractor in an upright position. Since respondent can point to no other evidence to support its contention and Mr. Guynn was the only actual witness to the incident, I have no reason to reject his credibility on this point. Certainly, it is also difficult to perceive of a man who was on fire taking the time to set a fuel cap down before abandoning a burning tractor, notwithstanding the fact that he did have enough composure to first turn off the ignition. (Guynn, Tr. 889-99, 926). Respondent's contention, based on speculation, must therefore be rejected.

incidents which have occurred, while not great in relation to the number of tractors which IH has produced, is a strong indication of such likelihood (Findings 29, 30, 32 and 33). This is especially true for those model tractors which do not have fuel gauges. Mr. Coleman, a retired chief product development engineer for respondent, testified that he was sure that even some of the IH personnel at its test facilities had taken the cap off such a tractor (one without a fuel gauge) when it was running, in order to determine how much fuel was left (Coleman, Tr. 1446). Many of the earlier model tractors involved herein did not have fuel gauges (Coleman, Tr. 1446). [18]

35. Owners and operators of IH gasoline-powered tractors have different degrees of knowledge concerning scientific principles which affect the fuel systems of tractors and tractor operation. Some have advanced formal education in engineering-related areas (Greathouse, Tr. 184-85), while others have had no formal instruction concerning such principles (Cox, Tr. 824-25). Regardless of the amount of training they received, many owners and operators of IH gasoline-powered tractors consider themselves knowledgeable about tractor operation and fuel-handling procedures (Buatte, Tr. 152, 155, 157, 160; Greathouse, Tr. 189-90, 195, 202-05; Cameron, Tr. 357-58, 380-81; Shawback, Tr. 569-70; Wohletz, Tr. 627, 651; Didion, Tr. 667, 670-71, 684-85; Holtz, Tr. 711, 725-27; Guynn, Tr. 873-84, 920-22; D. Jolicoeur, Tr. 754-55, 785-86; S. Jolicoeur, Tr. 812-13; Nichols, Tr. 2086-88, 2091; Clowes, Tr. 1826, 1828, 1868-69; Killingbeck, Tr. 5266-67). IH itself recognizes that farmers are generally familiar with the operation of IH gasoline-powered tractors (Borghoff, Tr. 4141). In fact, IH is aware that many farmers do much of their own tractor maintenance work (RF 411; D. Jolicoeur, Tr. 756; Allen, Tr. 3690-91).

36. Despite their familiarity with tractors and tractor maintenance, however, many tractor owners and operators were not aware of the potential for fuel geysering if the fuel cap were removed or dislodged from a hot or running IH tractor (Greathouse, Tr. 206; Kangas, Tr. 557; Shawback, Tr. 604, 606, 609; Wohletz, Tr. 634, 644-45, 652; Didion, Tr. 700, 705-06; Holtz, Tr. 409-10; Drummond Test. in *Stambaugh* case, CX 285E; Gaul Test. in *Stambaugh* case, CX 286F-G; Borghoff, Tr. 4130; Sullivan, Tr. 5143-44).

37. Had the owners and operators of such tractors been aware of the potential for fuel geysering it might have affected their decisions to purchase new or used tractors of this type, or their manner of care and use of such equipment (Buatte, Tr. 156-57; Greathouse, Tr. 233; Kangas, Tr. 504-05; Shawback, Tr. 589; Wohletz, Tr. 644-45, 652-54; Didion, Tr. 680-81; Holtz, Tr. 722-23).

VI. RESPONDENT'S KNOWLEDGE

A. *The Farm Tractor Engineering Department*

38. Since 1946, the Farm Tractor Engineering Department has been responsible for the design, testing and development of IH gasoline-powered farm tractors (Coleman, Tr. 946-47, 949). Since its inception this department has tested both prototype [19] and production tractors, as well as experimental tractors (Coleman, Tr. 950, 958, 1181, 1203). In general, it was responsible for all testing done on farm tractors by IH, except for testing solely related to quality control (Coleman, Tr. 951-53). However, it did not test individual components such as engines, electrical systems, distributors, filters, etc., not installed on complete tractors. It dealt only with the complete vehicle. (Coleman, Tr. 952).

39. The Farm Tractor Engineering Department, headed by the Manager of Engineering, was composed of two basic groups, the Design Group and Test and Development. Each group was supervised by a Divisional Chief Engineer who reported to the Manager of Engineering, directly or through his assistant. (CX 313; Coleman, Tr. 1184, 1978). IH engineer Richard N. Coleman was in charge of the test and development function during most of the time relevant to this proceeding (Coleman, Tr. 944, 948, 950; RF 24).

40. The Test and Development Group worked in close conjunction with the Design Group. The Design Group often gave Test and Development assignments to work on. (Coleman, Tr. 1072-73). The Test and Development Group, in turn, reported any type of investigation that would require design action to the Design Group (Coleman, Tr. 1181). In addition, the Test and Development Group reported results on prototype tractors which were performed after a design had been committed to a prototype (Coleman, Tr. 1181). The Test and Development Group's work on production tractors was also reported to the Design Group, including those engineers in the Design Group who were working on designs far into the future (CX 1; CX 2; CX 7; CX 11; CX 17; CX 19; CX 20; CX 41; CX 42; CX 44; Coleman, Tr. 1026-27, 1033, 1073, 1083-85, 1094, 1159, 1171, 1178-79, 1182).

41. Among other things, the Test and Development Group conducted field investigations into field problems arising with IH tractors (CX 36; Coleman, Tr. 956-57, 1204). Any written reports of such investigations were circulated to various engineers and in most, if not all, cases to the Divisional Chief Engineer of Test and Development (Coleman, Tr. 957, 1204). In addition, the Design Group requested the Test and Development Group to investigate particular problems arising in the field (Coleman, Tr. 1203). The Test and Development Group was given similar assignments, on occasion, by the Manager of Engineering,

who followed such investigations closely (CX 28; Coleman, Tr. 1119, 1122, 1145, 1216). [20]

B. The 1940's And Early 1950's

42. In the early 1940's, IH received reports that "fuel spurting" was occurring on its gasoline-powered tractors (RX 3 and 4). "Fuel spurting" described the condition where a solid stream of gasoline was expelled from the vent hole in the gasoline cap (Coleman, Tr. 1337), as opposed to "fuel geysering" wherein fuel and vapors are ejected from the filler neck when the cap is removed or dislodged. At the time fuel spurting came to IH's attention, IH gasoline-powered tractors used a flat gasoline cap which had a 1/16th inch vent hole in the top to allow proper venting of gasoline vapors inside the tank (RX 3; RX 131; Coleman, Tr. 1002, 1006, 1343, 1647, 1695; CX 379, Ziskal Dep., p. 21).

43. "Spurting" occurred when the cap was fully in place on the filler neck and involved a combination of factors, primarily the sloshing of fuel in the tank and the exhaling through the vent hole of pressure built up in the tank (Coleman, Tr. 999, 1000). The sloshing of fuel caused the fuel to get up into the chamber on the underside of the cap, where it was forced out of the vent hole as the pressure in the tank was exhausted during the normal venting process (Coleman, Tr. 1000). The pressure in the tank was caused by increased fuel temperatures due to heat flow to the tank (CX 1; RX 162; RX 163; RX 169; Coleman, Tr. 999-1004). Fuel spurting was a very common occurrence on IH tractors during the 1940's and early 1950's (Coleman, Tr. 1337-38).

44. IH knew, even in the 1940's and early 1950's, that increased fuel volatility could increase the pressure within the gasoline tank of its tractors, leading to a greater incidence of fuel spurting (Coleman, Tr. 1007-08). IH found that fuel spurting was most likely to occur in the Spring and Fall seasons and in hot-weather operations (Coleman, Tr. 1032; CX 379, Ziskal Dep., pp. 22-23).

45. IH received many reports of fuel spurting between 1941 and 1954; with such reports increasing in the late 1940's and early 1950's (RX 3; RX 161; RX 175; CX 1; CX 2; CX 6; CX 64A; Coleman, Tr. 1346). IH recognized that fuel spurting was a hazard (CX 18; CX 64B; Coleman, Tr. 1601). IH knew that fuel spurting increased the risk of fire and that operators could be sprayed with gasoline (Coleman, Tr. 1004, 1018-19; CX 6B; CX 379, Ziskal Dep., pp. 22-23; RX 162). In fact, a fire was reported to IH as a result of fuel spurting on an IH gasoline-powered tractor in June 1950 (RX 160).

46. An engineering docket was opened to deal with the fuel spurting complaints involving the flat cap, and the Test and Development

Group was instructed to experiment with design alternatives (CX 1; Coleman, Tr. 1343). The engineering undertook [21] to duplicate the condition as reportedly experienced in the field (CX 1; Coleman, Tr. 1343-45). They then tested a host of different types of caps and experimented with fuel tanks containing a variety of internal baffling arrangements under the reported circumstances for the purpose of determining whether other designs would overcome fuel spurting (CX 1; RX 161; RX 163; CX 2; RX 166; CX 64A; Coleman, Tr. 1345).

47. In the course of their dealing with the fuel squirting problem, respondent's engineers were aware that the heating of the fuel in the fuel tank was causing pressure to build up in the tanks of the IH tractors (Coleman, Tr. 999, 1026; CX 379, Ziskal Dep., pp. 23-24).

48. By July 1954, IH developed and made available a fuel cap which reportedly eliminated fuel spurting by using a series of baffles in the cap (CX 64; Coleman, Tr. 1036). The cap was designed and tested by IH (CX 7; CX 11; CX 64; RX 17; RX 171; Coleman, Tr. 1405). The cap had the same size 1/16th inch vent hole used on previous production caps which vented through a hole in the top of the cap (Coleman, Tr. 1647, 1695). IH referred to the cap as the triple baffle cap (Coleman, Tr. 1037, 1393; Link, Tr. 1997; CX 64). IH believed, as a result of testing, that the triple baffle cap overcame fuel spurting and was otherwise satisfactory in field operation (CX 13). IH therefore marketed the triple baffle cap for use on all IH tractors, claiming it reduced fire hazards (CX 18; Coleman, Tr. 1040).

49. In 1954, when IH began marketing the triple baffle cap, IH knew that using the cap on IH gasoline-powered tractors did not lower the temperature of the gasoline in the tank to any significant degree (Coleman, Tr. 1040). IH also knew that the cap did not affect the rate of heat flow to the gasoline tank of IH gasoline-powered tractors (Coleman, Tr. 1041). IH further knew that the difference in either the rate of pressure build-up or the amount of absolute pressure in the tank was not great, as between the flat cap and the triple baffle cap (Coleman, Tr. 1046, 1398-1400; Sullivan, Tr. 5190).

C. 1955-1958

50. By 1955, reports of fuel geysering incidents began to come to respondent's attention (CX 19A). By this time IH also was conducting tests to determine the amount of pressure build-up in the fuel tanks of its tractors, factors which influenced such pressure, and ways to deal with it (CX 16D-E; CX 17B; CX 19A; CX 20; Coleman, Tr. 1097). Although the amount of pressure build-up varied among these tests, IH knew in 1955 that factors present during the normal operation of its tractors, [22] such as engine heat, agitation of fuel in the tank, ambient air temperature and wind direction and velocity could sub-

